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THESIS

AN EVALUATION OF CONTRACT TERMINATION MODELS FOR SECONDARY ITEMS IN LONG SUPPLY

by

Steven W. Berger

June 1990

Thesis Advisor: E. Neil Hart

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An Evaluation Of Contract Termination Models For Secondary Items In Long Supply

by

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Captain, United States Marine Corps
B.S., University of Washington, 1985

Submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

This study discusses the use of decision models by the U.S. Navy in determining whether or not to terminate contracts for secondary items which have been identified as being long supply. Long supply for this thesis is defined as those items which are in excess of forecasted requirements and have one or more outstanding contracts either initiated or awarded. The decision variables and parameters of the Chapman Termination Model and the Naval Supply Systems Command's termination model are evaluated in an attempt to determine the feasibility of using each in a working environment at the Navy Aviation Supply Office. The Chapman Termination Model is determined to be an unsuitable model due to the assumptions it makes regarding the availability of certain data, the timeliness of actions, and the relationship between the item manager and the buyer. Recommendations are given for the combining and implementation of the Naval Supply Systems Command's model with the Online Requirements Determination Model currently used by the Navy Aviation Supply Office to form one decision model which could be used by item managers at both Navy inventory control points.

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I. INTRODUCTION

A. RESEARCH OBJECTIVES

Inventory item managers are responsible for maintaining adequate levels of wholesale inventory for distribution to intermediate stock points as required. If the item manager has forecasted that demand for a particular item will be greater than the levels currently on-hand, he[1] will submit some type of document to the organization's procurement personnel in order to initiate a purchasing action.

For reasons beyond the item manager's control, the initial forecasted requirement for an item may change one or more times prior to the receiving the ordered item. Depending on the exact time the requirement changes, the decision of whether or not to terminate ordered quantities can be difficult. If the new requirement is less than first computed, the excess material becomes what is called Due-In Long Supply (DILS). In this situation, a decision must be made whether to reduce the quantities ordered by modifying the contract and providing the supplier financial consideration or to let the order proceed as is with the result being a discrepancy between authorized and on-hand stock levels.

The frequency with which forecasted requirements change, as well as the different types of performance measurements by which both item managers and buyers are

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[1] The researcher recognizes that both male and female employees perform the functions of item managers and buyers within the Navy. However, the pronoun "he" will be used throughout this study for consistency.

evaluated, may lead to erroneous decisions being made in regard to contract terminations. These erroneous decisions will almost always result in the Navy experiencing increased costs and/or discrepancies in stock levels which impact budgets, inspection results, and spare parts support.

The need to assist the inventory control point (ICP) item managers and buyers in making the best business decisions on whether or not to terminate a contract for secondary items[2] in long supply has been recognized for many years. In an attempt to simplify the decision making process, Gary Chapman's thesis (1988) formulated a termination decision model for secondary items in long supply and proposed its implementation at the Navy's two ICP's. Although the formulation of this model was based solely on the business practices at the Navy Ships Parts Control Center (SPCC), Chapman suggested that the model would also be applicable at SPCC's sister ICP, the Navy Aviation Supply Office (ASO).

Prior to Chapman's Termination Model, the Naval Supply Systems Command (NAVSUP) directed the Fleet Material Support Office (FMSO) to design a contract termination model which would evaluate whether or not to terminate a contract based on a cost-benefit tradeoff analysis. Chapman discusses this NAVSUP model in his thesis and speculates that it will not work as effectively as his own model because of the inherent

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[2] DODI 4100.39 defines secondary items as end items, replacement assemblies, parts, and consumables, other than principal items. Using this definition, a secondary item can be either a consumable or repairable item.

subjectivity of the decision variables it uses and the fact that it only evaluates quantitative information, not qualitative.

This study evaluates the logic and applicability of the decision variables used in the Chapman Termination Model and the NAVSUP Contract Termination Model. It then explores the feasibility of implementing either the Chapman Termination Model or the NAVSUP Contract Termination Model at ASO and then recommends a method for establishing what this researcher believes would be a more effective model.

B. RESEARCH QUESTIONS

The primary research question, which was the focus for this research is:

> Can the Chapman Termination Model for secondary items in long supply be used in a working environment to accurately determine those items for which contracts should be terminated?

From this basic question, five subsidiary questions were developed:

1. How are items determined to be in excess of requirements by the Navy Aviation Supply Office?

2. How are decisions to terminate the contract of an item in long supply currently made at the Navy Aviation Supply Office?

3. What are the key characteristics, in terms of decision variables and parameters, necessary for an accurate and reliable termination model?

4. Are there decision variables or parameters that should be added to or deleted from the Chapman Termination Model?

5. Is the NAVSUP Contract Termination Model a feasible alternative to the Chapman Termination Model?

C. SCOPE OF THE STUDY

This study concentrates on the current methods used by one of the two Navy wholesale inventory activities (ASO) to determine contract terminations of secondary items in long supply. The methods used by the second activity (SPCC) are discussed briefly since they are the basis of the logic embedded within the Chapman Termination Model.

The study then evaluates the feasibility of using either the Chapman Termination Model or the NAVSUP Contract Termination Model to determine contract terminations in a working environment. The policies and procedures affecting the costs and constraints associated with inventory management and procurement are also considered.

No other unique problems associated with inventory management, procurement support, or the organizational structure at ASO or within the Department of the Navy are considered.

D. ASSUMPTIONS OF THE STUDY

Two significant assumptions are included in this study. The first is that the reader has a general understanding of inventory management and procurement principles and specific knowledge of the Chapman Termination Model and the issue of long supply. The second is that the information concerning policies, procedures, costs, and constraints applicable to inventory control and procurement at ASO were complete and accurate as of the date of this study.

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valuable assistance in clarifying information regarding computer hardware, software, and locally generated application programs which are used by ASO, but are not documented in published literature.

F. ORGANIZATION OF THE STUDY

This study is organized into six chapters. Chapter II provides the reader with a background of long supply issues within the services and at ASO specifically. It also incudes several of the major issues surrounding long supply. Some of the issues included in this discussion are how items go into a long supply position, what can be done with material in long supply, and how terminating contracts for items in long supply can actually result in additional costs.

Chapter III describes some of the various aspects of inventory management. Areas discussed in detail include inventory systems, the Wilson EOQ model, service level and safety stock, and inventory costs. It then provides an overview of the U.S. Navy's supply system and discusses the procedures used by the Navy in the requirements determination process.

Chapter IV analyzes the Chapman Termination Model in terms of the decision variables and parameters used and focuses on the strengths and weaknesses of these elements. The assumptions this researcher feels were made when formulating the model and the problems these assumptions cause in the effectiveness and efficiency of the model are discussed. This researcher provides a list of the variables which should be excluded from the model because they are either irrelevant or too complicated for inclusion in the

model. The variables contained in the model that are applicable to a termination decision are then discussed.

Chapter V analyzes the decision variables and parameters used in the NAVSUP Termination Model. The history and major components of the model are discussed and then the various cost elements are analyzed. As in Chapter IV, the major advantages and disadvantages of the model are explained.

Chapter VI provides conclusions this researcher made based on this study and answers the research questions posed in Chapter I. Recommendations are then made for how ASO could improve termination decisions by incorporating the best attributes of the current models into a single system using the computer hardware and software currently available at ASO. Finally, the study concludes with suggestions for areas of further research.

II. BACKGROUND

A. INTRODUCTION

The military depends on a constant flow of supplies and material to ensure it is constantly prepared for any contingency. The responsibility for this massive task rests primarily with the men and women, military and civilian, who are employed within the military supply systems. However, the ability of these people to perform their mission is effected by numerous decisions made by people within and outside the supply system. This influence can result from policy decisions, decisions to purchase new weapon systems, or even a decision to replace a repair component.

As the technology of our weapon systems increases, so do the demands placed on highly technical secondary items - spare and repair parts. Whether the item is a turbine blade for a jet engine on a multimillion dollar aircraft or a spring for an M-16 rifle, the availability of all spare parts directly affect the operational capability of the Armed Forces. The ability to ensure this availability, by predicting how many and when these critical secondary items will be needed has been a concern of management for years.

While every military organization would like for its equipment to be operationally ready 100% of the time, this level of readiness would entail such a large amount of resources, both fiscal and physical, that a balance must be struck between preparedness and resource constraints. This balance results in the services attempting to maintain a level of readiness that can be easily justified to those committees and agencies responsible

for military oversight. Maintaining a level that is felt to either exceed or fall short of that necessary often results in Congressional inquiries, General Accounting Office (GAO) audits, and Department of Defense Inspector General (DODIG) investigations with the outcome of these queries usually being a finding of poor management policies and procedures within the services. (Chapman, 1988, pp. 8-9)

The task of managing to constantly changing operational commitments and programs and a shrinking budget provides a harried environment for the persons and data processing equipment whose responsibility it is to provide supply support to the services. As a result of this environment, the supply availability criteria established by the services and the inventory levels necessary to meet these criteria are also in a constant state of fluctuation.

When the forecasted requirements for an item changes as a result of some variable effected by the environment, there is a high probability that the item will end up in either an excess or deficit inventory position. If the item ends up in a deficit position, the item manager responsible for the item will submit a purchase request to buy additional quantities of the item. However, if the item ends up in an excess position, action needs to be taken by the item manager to reduce the quantities of excess material in order to save the service money.

In order to identify actions that may be taken to reduce excess material, a clear definition of excess material must be understood. An excess position occurs when the amount of material either on-hand, on-order, or both exceeds all known requirements for the item. The sum of these known requirements is called the retention limit and is

composed of actual and forecasted demands, planned program requirements (PPR's), and war reserve stocks.

While the term excess is generally used to identify all material which is above an item's established retention limit, this usage is misleading since the definition of excess material can be further divided into three categories. These are: (NAVSUP PUB 553, 1988, p. 4-36)

1. excess - that quantity of material which exceeds the authorized retention limit and is on-hand;
2. due-in long supply (DILS) - that quantity of material which exceeds the retention limit and has one or more contracts awarded for its procurement;
3. due-in contract initiated (DICI) - that quantity of material which exceeds the retention limit and has one or more purchase requests initiated for its procurement.

The only options available to reduce true excess material are to either hold the material in inventory until it is needed or to dispose of it according to prescribed methods. Since computing the costs incurred through these methods is a fairly simple mathematical computation[3], this study concentrated on that excess material which fell into the last two definitions above.

This researcher has elected to use the term long supply throughout this study to refer to material described by either of these definitions since the majority of the literature

[3] The costs incurred by holding the material in inventory until it is needed are computed by multiplying the value of the excess material by a holding cost percentage set by each service. The costs to dispose of the material are the dollar value of the material turned over to disposal units plus the administrative and transportation costs associated with conducting the disposal action.

reviewed used these definitions in the same manner. During the literature review for this study, this researcher noted that all of the above definitions were often used synonymously not only by the various services and audit agencies, but within these organizations as well. This led this researcher to be suspicious of the volume and dollar values of items which have been reported in long supply positions over the [illegible] years.

B. AUDITS OF LONG SUPPLY

Since the end of World War II, the GAO and DODIG have continually made inquiries into the reasons for and solutions to material in long supply. Chapman (1988) specifically cites ten studies and states that an additional 21 have been conducted on the inventory management practices of the various services and agencies throughout the past thirty years.

The problem of long supply assets has received such a vast amount of attention because of the dollar values associated with it and the potential savings that could be realized by reducing or curtailing its existence. Additionally, the current budget reductions confronting the services make the area of long supply material an attractive avenue for potential future savings.

With so much attention having been and still being devoted to long supply, why has this problem not yet been solved? The primary answer to this question lies in the numerous reasons why material can go into a long supply position. Some of these reasons include: (NAVSUP PUB 553, 1988, p. III-2)

1. material turned into store (MTIS) from various customers;

2. fluctuations in demand;

3. changes in the customer base, either in the number of operational units or the end item or secondary item migrating to a different level of maintenance;

4. questionable buys for stock as a result of erroneous data being used by the requirements determination program;

5. allowance list churn, the continual change in the output from the various requirements determination applications;

6. inadequate stock records;

7. inaccurate inventory records;

8. untimely reviews of stock records;

9. discontinued programs; and

10. failure of ICP's to communicate with one another, one service not telling another of planned modifications and changes to material requirements.

When the services were questioned by GAO or the DODIG as to why they have not reduced the number of assets in a long supply position, each of the services initially claimed that the material is kept to meet future requirements. (GAO/PLRD-82-121, 1982, p. 6) The major obstacle to this rebuttal is the difficulty the services have in proving that they 1) actually used the material to meet future demands and 2) that the costs incurred from holding the material was less than would have been realized had the current contract been terminated and the item reprocured at a later date.

One audit of contract terminations at ASO conducted by the Defense Audit Service (1979) attempted to determine whether these items could actually be used to meet future

demands as the services claimed. An analysis of 8,229 items for which contracts had been terminated revealed that 1,530 (19%) of these items had been reprocured within one to three years. The audit determined that ASO spent an additional $7.3 million dollars in actual procurement costs plus the administrative costs of processing 2,633 individual procurement actions to reprocure the quantities that had been canceled. The conclusion reached by this particular audit was that the costs to hold these particular items would have been far less than the reprocurement costs actually experienced.[4]

While this lone audit does not justify tying up vast amounts of dollars in expectation of future demands, there do appear to be other legitimate reasons for a service to over order material. These reasons include: (Chapman, 1988, p. 17)

1. valid, known requirements were excluded from the initial requirements computation;
2. different criteria existed for asset application in the Stratification decisions and the supply control decisions resulting in different supply positions; and
3. items were obtainable only from Diminishing Manufacturing Sources (DMSMS).

While these reasons justify a few isolated instances for an item manager to over order material, they do not account for the significant quantities of items that are in long supply. The primary reason for items to be over ordered appears to be the inability of the services to accurately forecast their requirements. How requirements are determined

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[4] This audit used an inventory holding cost factor of 1% which the researcher feels was unrealistically low. A more appropriate inventory holding cost factor is discussed in Chapter III of this study.

and the inherent problems of forecasting requirements are discussed in Chapter III, so the remainder of this chapter focuses on alternatives for handling material that is in long supply and the structure and long supply issues of ASO.

C. ALTERNATIVES FOR DEALING WITH LONG SUPPLY ASSETS

The easiest alternative for dealing with long supply assets is to simply continue the procurement action and then hold the material for use at a later date. However, the costs associated with holding inventory can make this a costly alternative unless it is known that there will be a requirement for the material in the very near future and that the material will not become obsolete.

A second alternative, which is actually an off-shoot of the first, is to continue to procure the material, but then redistribute it from wholesale inventories for other uses. One such use could be to provide the material to foreign military sales (FMS) customers in lieu of establishing repair and return programs. (Naval Message, 1986, p. 1-2) Another use could be to furnish the material to contractors as either government furnished equipment (GFE) or government furnished material (GFM) to be used in production contracts as directed by the Naval Air Systems Command in its instruction NAVAIR INST 4341.4. (1982) This option allows the service to avoid the costs of terminating the contract while providing an economical use for the long supply material.

This second alternative has been proven to be a sound concept from a cost savings point of view. For example, by providing contractors with 17 items for the production of F-14 aircraft, the Naval Air Systems Command (NAVAIR) realized a savings of

$525,000. However, this alternative does not appear to work extremely well for most items. In a recount of efforts which have been made by the Navy to provide long supply material to contractors as government furnished equipment, a GAO report cited the following data: (GAO/PLRD-82-121, 1982)

1979: ASO identified $8.1 million worth of long supply assets for use in production contracts
NAVAIR offered $6.6 million of these assets to contractors
Various contractors agreed to accept $2.3 million for 1981-82 production
NAVAIR ended up delivering only $636,000 worth of the assets

1981: ASO identified 515 items in long supply worth $8.7 million for use in production contracts
NAVAIR offered 369 items valued at $5.4 million to contractors
Various contractors accepted 61 items worth $1.3 million for 1983 production

Reasons for the lack of effectiveness of this alternative appears to be twofold. First, inadequate coordination between NAVAIR and the ICP's during the screening and verification of available items effects the timeliness of providing the identified items to the contractor. This results in available assets being offered to contractors too late to be efficiently used in production contracts.

Second, the majority of defense contractors are opposed to accepting government furnished equipment. Most contractors state that their unwillingness is due to the diminished control they have over correcting problems they may experience in delivery schedules, item quality, and component interface. However, another significant reason is probably the inability to add overhead costs and profit to the items being furnished. Additionally, those that are willing to accept these risks will usually withdraw as many

product warranties as the government contracting officer will allow since they cannot be assured of that the part being provide meets the contractor's own quality standards.

The last GAO report issued on this subject (GAO/PLRD-82-121, 1982) cites the fact that the utilization of long supply aviation assets in new production contracts continues to fall short of the optimum effectiveness possible. Conversations with personnel from Operations Policy and Control Division (Code 035) at ASO lead this researcher to believe that the situation has not improved since this GAO report was published.

The last alternative for dealing with long supply assets is to completely or partially terminate the contracts and purchase orders which exist for the excess material. Terminating purchase orders creates control and administrative burden, but is not a significant problem for the services since these actions are internal to the procuring organization. However, terminating a contract that has been awarded can create major obstacles since the contracting personnel must settle all outstanding debts of either the government or the contractor. For this reason, the contracting organization should always terminate purchase orders before terminating awarded contracts.

When the need to terminate a contract does arise, the government must decide which of four termination methods it will use. The decision of which option to exercise must be determined according to the reasons for terminating the contract. If the contracting officer errs in selecting the appropriate termination type, the contractor will quickly respond with a protest or claim which could lead to increased termination costs.

The first type of termination is a termination for default. A termination for default can only be made when there is substantive evidence that the contractor has willfully or

through his own fault committed some act which provides clear indication that he has failed or will fail to perform in accordance with the contract specifications and schedules. (Cibinic and Nash. 1986, p. 667) Most government contracting personnel consider this to be the hardest type of termination to invoke because of the significant potential for contractor protests. However, a contract should be terminated for default if the contractor is not complying with the terms of the contract and there is a high probability that the required service or material will not be supplied. Important to this study is the fact that the government does not have the right to terminate a contract for default if it does not have a proper motive.

The second type of termination is a no cost settlement. This type of termination is a bilateral agreement between the contractor and the government which may be entered into if the contractor has not incurred or is willing to waive any costs incurred on the terminated portion of the contract and there are no obligations due the government under the contract terms. This type of termination is typically used when the contractor and the government agree that the work specified in the contract cannot be performed as specified, is beyond the scope of the contract, or will financially impair the contractor. (FAR, 1987, 49.101) As the name implies, in a no cost settlement the contractor and government dissolve the contract with neither party seeking additional financial consideration. However, very few no-cost settlements are ever enacted.

The third type of contract termination occurs when the government refuses to obligate funds for the continuance of the contract. This termination may be invoked

under the Limitation of Funds Clause, but is an unlikely method to use to terminate a long supply contract and will not be discussed in this study.

The final type of termination is the termination for convenience. This type of termination can be the most difficult to finalize, but is the type most often used by ASO for long supply contracts. Hughes and Duke (1985) state that terminations for convenience are most commonly the result of the following:

1. the Federal Government is no longer in need of the product being manufactured;
2. a change in the specifications for the contracted item;
3. a change in political policy;
4. poor contract administration;
5. there has been a "bad buy" (improperly justified, impossibility of performance, or insufficiently researched requirements); or
6. a termination for default is overturned by a board of contract appeals and a termination for convenience is awarded.

The ability of the government to terminate a contract for convenience is required to be stated within the contract wording. If the appropriate clause is left out of the contract, the government is still guaranteed the right to terminate for convenience by the Christian Doctrine. This doctrine upholds the various courts' interpretations that the government, as a sovereign, is protected from civil or penal damages as a result of erroneous acts or omissions by its employees.

Because of the inherent power given to the government in these matters, the contracting officer must ensure that the government has the right to terminate for

convenience. The courts have determined that a termination for convenience cannot be exercised if the contracting officer is acting in bad faith, there has been no changes in circumstances, or there has been no violations of paramount government policies. (Cibinic and Nash, 1986, pp. 822-825)

When the contracting officer does exercise a termination for convenience, the government must admit its liability and allow the contractor to recover the costs he has incurred for work performed on the contract plus a reasonable profit. Recoverable costs are negotiated in accordance with the Department of Defense Federal Acquisition Regulation Supplement (DFARS), local directives, and cost accounting standards applicable to the type of contract being terminated.

A significant issue in determining whether or not to terminate for convenience are the costs which will be incurred by the government for items it may receive partially completed or not receive at all. While the Federal Acquisition Regulation (FAR) recommends that contracts with a dollar value less than $2,000 always be allowed to run to completion, the vast majority of contracts awarded are far greater than this nominal price. (FAR, 1987, 49.101) This results in cost and completion data being required for virtually every contract being considered for termination.

The GAO and DODIG have continuously criticized the services for failing to acquire actual cost and completion data prior to deciding to terminate a contract. Additionally, both of these agencies have also criticized the services for not making termination decisions in a timely manner. This researcher feels that the services are guilty of both of these criticisms because of the magnitude of information which must be

accumulated prior to making a termination decision and the fact that this information can usually only be obtained from the contractor who is facing the termination.

In an attempt to respond to these criticisms, the Navy ICP's began requesting the Administrative Contracting Officers (ACO's) located within the Defense Contract Administration Service (DCAS) to provide the ICP's with the information necessary to make termination decisions in a timely manner. DCAS responded to these requests by informing NAVSUP, the ICP's senior command, that the DCAS ACO's could not handle the work load the ICP's were placing upon them and requested that the ICP's not submit additional inquiries for contractor termination costs. (DLA Letter to NAVSUP, 1988)

NAVSUP responded favorably to this DCAS request by issuing a policy to the ICP's which made the procuring contracting officers responsible for gathering contract termination data. NAVSUP also provided the ICP's with a uniform set of procedures which specified what data the procuring contracting officers should gather and how they should solicit this data from contractors. (NAVSUP Letter to ASO and SPCC, 1988)

NAVSUP's response to DCAS appears to have been in vain since shortly after issuing its policy and procedures, all of the services were criticized by a DODIG audit for obtaining termination data directly from contractors. The DODIG stated that much of this information was inaccurate and that the services were making faulty decisions by relying on it. (DODIG Audit No. 8AC-5006.03, 1989, pp. 19-29) However, part 42.302 of the FAR (1987) states that accumulating termination cost data is not a function of the administrative contracting officer and so guidance needs to be provided by DOD

concerning who is responsible for collecting termination cost data and how this information should be collected.

Another question raised by both GAO and the DODIG is who is responsible for making a contract termination decision. Both agencies have stated that the responsibility for termination decisions should not be placed upon the contracting officer (the buyer) since he has no knowledge of the costs which would be incurred as a result of holding inventory. They feel that the item manager would be better able to make a determination from an economical perspective since he knows what costs are being incurred from holding the inventory.

This researcher feels that both opinions expressed above are erroneous. The percentage used for computing holding costs are established at the service level and published in service directives. It would be just as easy for the buyer to obtain this information as it would for the item manager since neither uses this information in the performance of his daily tasks. The optimal choice would be to have the termination decision made with both the item manager and the buyer acting as a team. This would allow input from both functional areas, but would also require considerable coordination.

D. THE AVIATION SUPPLY OFFICE

The Navy Aviation Supply Office is located in Philadelphia, Pennsylvania, and has as its principal mission the inventory management of aeronautical spare and repair parts. ASO's primary management objective is to establish and maintain sufficient quantities of stock in the supply system to support material needs of the Navy's aviation community.

This objective is accomplished by procuring stock and determining where stocks should be kept to ensure the greatest availability to it customers. (GAO/PLRD-82-121, 1982, p. 6)

While the workload at ASO is influenced by the amount of military hardware in use and the intensity of fleet operations, the workload appears to remain fairly constant with item managers controlling approximately 252,250 items and receiving over 1.61 million requisitions annually. In supporting the item managers' requirements, the procurement sections at ASO initiated over 37,000 contract actions and expended $1.8 billion in acquisitions during Fiscal Year 89. Additionally, ASO employs more than 4,000 military and civilian personnel and has an operating budget of $92.3 million to accomplish its mission. (ASO Planning and Data Systems Directorate)

While the problem of long supply at ASO has existed for virtually as long as ASO has been established, this problem has begun to receive proactive management attention. Until recently, when an item was determined to be in long supply, the item manager was required to proceed through a set of steps which were designed to aid him in reaching a termination decision.

The actual steps used by the item manager depended upon the type of material being procured. But regardless of the type of material being procured, purchase requests were always to be terminated before awarded contracts. Also, there was no minimum dollar value for terminating a purchase request so it could be reduced whenever a material was identified as long supply.

If there were no outstanding purchase requests or if all purchase requests had been terminated and there was still long supply material, then the item manager could evaluate awarded contracts to attempt to reduce the amount of long supply material. However, no contracts were to be terminated if: (ASO OP Policy #245, 1989, p. 4-5)

1. the dollar value of the contract was less than $50,000;
2. 50% of the production leadtime established in the contract had elapsed;
3. there had been any shipments against the contract in question;
4. there were PPR's in the outyears (not counted in Stratification), the item manager was to reduce the DILS by the summed quantity of these PPR's; or
5. if a partial termination had been calculated, the item manager was to subtract the calculated termination quantity from the full quantity on contract; if the result was less than the EOQ, the item manager was to attempt to terminate the full quantity on order; if the result was more than EOQ, the item manager was to attempt to terminate only the calculated partial quantity.

Additionally, if the item had a cognizance symbol (COG) of 1R, 3R, or 0Q (consumables), then the item manager was not allowed to terminate the material if less than 10% of the total on order for the applicable contract was long supply. While these decision rules give the impression that ASO was making a concerted effort to reduce the amount of material in a long supply position, the fact is that until early 1988, very few procurements were actually terminated. (Personal conversation with personnel from ASO Code 035)

The number of contract terminations did not begin to increase at ASO until a DOD wide moratorium on disposing of excess material was lifted in early 1988, even though

the moratorium was directed strictly at excess material which was on-hand. From January 1988 to November 1989, ASO terminated contracts valued at $96.6 million for 1R items and $142.6 million for 7R items.

After the disposal moratorium was lifted, ASO shifted its method of determining contract terminations away from the step method. The current policy at ASO is to terminate all items that are determined to be in long supply after inventory requirements are calculated. There is currently no analysis done to determine whether or not the choice to terminate a contract is the most economical decision to make in spite of the numerous criticisms mentioned in the previous section.

While the overall percentage of long supply assets has been steadily decreasing over the last three years, this is primarily due to a large numbers of purchase requests which have been terminated. The amount of material in long supply has actually remained fairly constant until the March 89 Stratification run. While there are efforts being made to reduce these amounts of long supply material, there are no methods currently established to evaluate these termination decisions from an economical perspective. If the costs which will be incurred as a result of a termination are considered, they are considered using little, if any, standardized methodology.

E. SUMMARY

This chapter has provided a background of the subject of long supply assets in the military services. It has discussed the emphasis placed on long supply by the various investigative and oversight agencies within the Federal Government and has listed some

of the major problems identified by these agencies. The alternatives for dealing with long supply assets was discussed in depth with emphasis placed on the alternative of contract terminations. Finally, the Aviation Supply Office and its current policies regarding long supply aviation assets was described. Chapter III will discuss the theory of inventory management and will describe the U.S. Navy's inventory management and requirements determination systems.

III. INVENTORY MANAGEMENT

A. INTRODUCTION

Thomas Whitin (1957) stated that inventories are often referred to as the "graveyard" of American business. The prevalence of this statement seemed to have been due to the fact that improperly managed inventories often lead to surplus stock which was a principal cause of business failures during that time period. While the continually improving research techniques used in the fields of operations research and operations analysis have helped lead today's business managers away from this unpopular view of inventories, the unnecessary costs incurred through improperly managed inventories are still very real and can still cause the downfall of a business.

If inventories can have such a negative impact on a business, why do businesses continue to create and maintain them? Although inventories can exist for a multitude of reasons, the predominant reason for maintaining inventories is that they are needed to assure the survival of most businesses.

Other reasons for maintaining inventories are usually inter-related with the most common including: (Chase, 1989, p. 580)

1. to maintain independence of operations within an organization;
2. to allow flexibility in production scheduling;
3. to provide a safe ard for variations in raw material availability and delivery times;

4. to allow for the constant variation experienced in product demand, hence avoiding lost sales due to stockouts; and

5. to reduce the costs of procurements, either by reducing the number of orders placed, by taking advantage of economic purchase order size, or both.

These reasons dictate that business managers, like military commanders, must decide what the right level of inventory to maintain is. The ultimate goal is to have the correct type and amount of supplies available while incurring the least possible total cost. (Blanchard, 1986, p. 57) However, in the production or sales manager's view, there can never be enough inventory. In the financial officer or accountant's view, any amount of inventory is an expense to the business and is too much. Business leaders must consider the legitimate concerns of each of these functional areas and establish an inventory system which is the least painful for all involved.

Regardless of the specific reasons a business may have for maintaining an inventory, an adequate inventory system must be established to ensure efficient and cost effective control. An inventory system is commonly defined as "...a set of policies and controls that monitors levels of inventory and determines what levels should be maintained, when stock should be replenished, and how large orders should be." (Chase, 1989, p. 579)

B. INVENTORY MODELS

A critical element of every inventory system is the model it uses to establish inventory levels and reorder quantities. Of the numerous models currently in existence, the two most commonly used by both the private and public sectors are primarily

differentiated by the timing of inventory reviews and the quantity of material ordered when replenishment of depleted stocks is considered necessary. These two models are referred to as a fixed-order quantity model and a fixed-time period model and are discussed below.

1. Fixed-Order Quantity Models.

This type of model is commonly referred to as a Q-system by the literature and is an event triggered model. It involves the continuous review of stock levels through some form, usually automated, of process reporting. In effect, the system continuously monitors the withdrawal of items from and replacement of items to the inventory as they occur. When the level of stock drops to a predetermined quantity known as the reorder point, the system will automatically generate a reorder requirement. This is what is meant by the term event triggered. The depletion of the inventory to the reorder point generates (triggers) a reorder (an event).

As implied by its name, the quantity of material which will be ordered using this system remains the same for every reorder event. This quantity is considered to be the optimal economic quantity to reorder and is usually determined with the Wilson Economic Order Quantity (EOQ) model. This EOQ model (Equation 1) considers the costs to order, unit cost, inventory holding cost, and the annual demand of the item in deriving the optimum order quantity. The cost trade-offs considered by the EOQ model are depicted by Figure 1.

$$Q^{*} = \sqrt{2\frac{DS}{IC}} \qquad \text{(Equation 1)}$$

where:

Q* = the quantity to be reordered

S = the average cost of placing an order, in dollars

I = the cost of carrying an item in inventory, as a percentage of cost

D = the annual demand for the item, in units

C = the value of a unit carried in inventory, in dollars

Note - the computation for items classified as repairable also takes into account regenerations, the return of serviceable items to a ready for issue status.

Unfortunately, the Wilson EOQ model provides an oversimplified view of a very complex environment. This occurs because the model contains a set of assumptions which simplify many of the conditions that may actually exist in a business environment. This will effect the reorder decision the model derives and should be taken into consideration, especially if the actual business conditions are considerably different from the assumptions.

The assumptions of the EOQ model are: (Ballou, 1985, p. 372)

1. the demand for the product is known with certainty and is constant and uniform;
2. leadtime is constant;
3. price per unit of product is constant;

4. inventory holding costs are based on average inventories;

5. ordering and/or setup costs are constant; and

6. all demands for the product will be satisfied, hence backorders are not allowed and there is no safety stock since the reorder quantity will arrive before stock levels are entirely depleted.

The ability of the Q-system to reorder the same quantity every time a replenishment is needed is possible because the established reorder point takes into account the variability of demand and the level of demand that will be experienced during procurement leadtime. The reorder point must be set at a level which will allow stocks to be depleted to as low a level as possible, yet never reach zero before the ordered quantity arrives.

However, this demand is independent of operations and will therefore result in some demand variance. (Discarding one of the assumptions of the EOQ model.) This problem can be dealt with by establishing a safety stock to draw material from if actual demand exceeds forecasted demand during the procurement leadtime.

The nature of the Q-system provides the user with continuous visibility of stock levels so inventory can be reordered as soon as a requirement is reached. This results in the maintenance of less inventory and a decreased probability of stock being depleted to zero while maintaining a high level of readiness. The Q-system is therefore especially applicable at ASO because the majority of the items procured by ASO are critical for the continuance of operations and have a high dollar value. Figure 2 depicts the Q-system in operation as described by Ballou (1985).

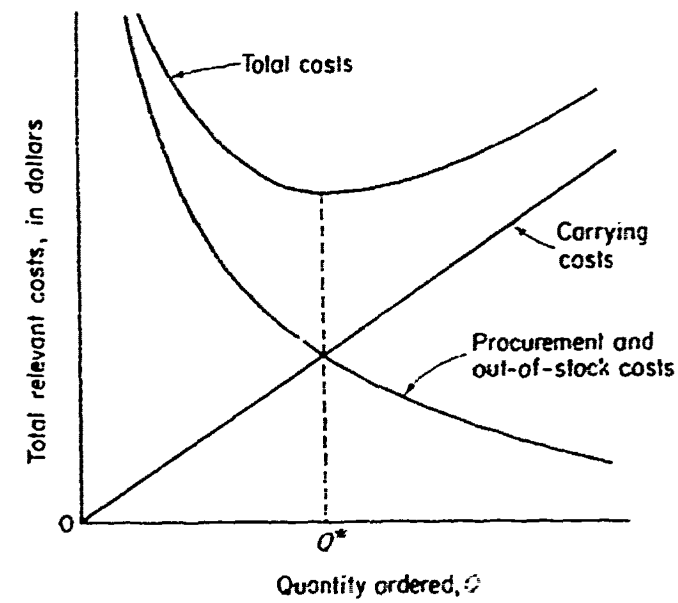

Figure 1: Cost Tradeoffs Associated with the EOQ Model

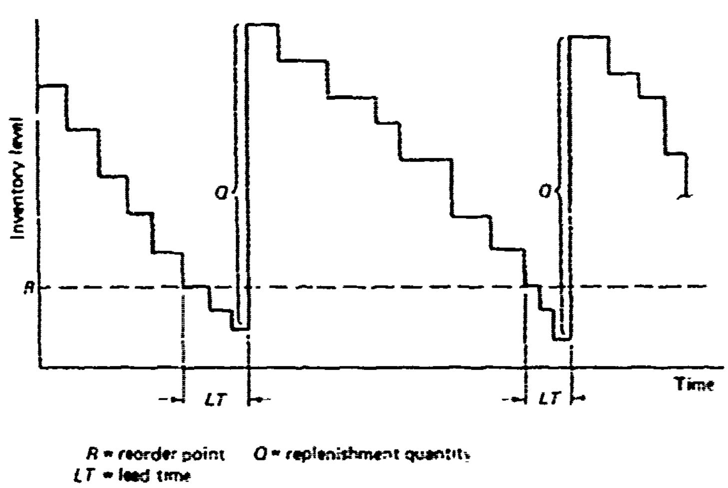

Figure 2: Fixed-Order Quantity Model (Q-System)

2. Fixed-Time Period Models.

Unlike the event triggered Q-system, this model, often referred to as a P-system, is time triggered. Inventory levels are reviewed only at particular times, such as every week or every month, instead of on a continuous basis as in the Q-system. When the review of stock levels is conducted, the system determines if a reorder is necessary by computing the difference between a predetermined requisitioning objective and the amount of inventory on-hand. If there is a difference in these positions, the system generates a requirement to reorder a quantity equivalent to the net difference.

When implementing a P-system, management must decide on the value of two variables. These variables are the requisitioning objective and the time intervals at which to review stock levels. The value of the requisitioning objective should be set equal to the expected demand plus any variation in demand which may occur between review periods.

This constraint results in the need for larger on-hand inventories in the P-system than in the Q-system to compensate for the variation in demand and the possibility of one or two large requisitions depleting the inventory to zero shortly after a review is conducted. This system is especially desirable when vendors request orders be placed at specific times or when it is advantageous to consolidate orders. When inventory is managed centrally but physically dispersed in several locations, it is difficult to monitor the total inventory level continuously - unless a sophisticated computer system is in place. In such cases, periodic review is also warranted. Figure 3 depicts the P-system in operation as described by Ballou (1985).

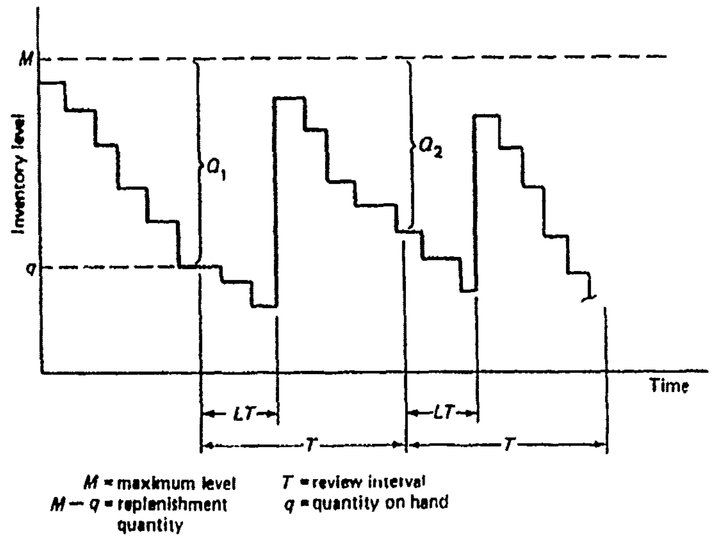

Figure 3: Fixed-Time Period Model (P-System)

C. SERVICE LEVEL AND SAFETY STOCK

Chapter I discussed the balance that must be established between operational preparedness and the costs associated with maintaining various levels of readiness. For inventory management purposes, the level of readiness is translated into customer service level. This customer service level refers to the number of units that can be supplied to the requesting customer from stock currently on-hand and is typically measured as a percentage of annual demand. (Chase and Aquilano, 1989, p. 587)

The current Navy goal is to provide a customer service level of 85% which will result in 85% of the annual requested demand for an item being filled from on-hand stocks. To determine how effectively the system is meeting this goal, the Navy uses a

performance measure of effectiveness at the wholesale inventory level called System Material Availability (SMA). SMA is defined as the percent of requisitions which are satisfied by the inventory assets on-hand and is prepared monthly by an automated data processing system. (NAVSUP PUB 553, 1988, p. 43)

Both of the models discussed previously assume there will be material available for issue 100% of the time since inventory should be replenished prior to stock being depleted to zero. However, these models are tasked with ensuring the availability of items that have both independent demand and procurement leadtime. The variability associated with these two elements in an actual business environment results in replenishment not always occurring as planned since not even the best forecasting techniques available can accurately predict when and how much to order 100% of the time.

If demand, procurement leadtime, and their variability are not accurately predicted, a business may not be able to meet its customer service level and a stockout situation would occur. In a commercial environment, the costs associated with this situation can range anywhere f n the loss of customer goodwill to the downtime of expensive production f ies. In a military environment, this situation could result in the degradation or total loss of a unit's operational capability.

The primary means of ensuring that the desired customer service level is met is to maintain additional inventory as safety stock. The purpose of this safety stock is "...to compensate for unexpected demands, repair and recycle times, the [replenishment] pipeline, procurement leadtimes, and unforeseen delays." (Blanchard, 1986, p. 56) The

actual quantity of material maintained as safety stock is determined by statistical procedures that deal with the random nature of the variables involved and the level of customer service desired.[5]

The item manager at the ICP must be aware of the policies affecting the customer service level so that he can react to unforeseen circumstances. However, since SMA can provide supervisors with an evaluation of item managers' ability to support their customers, the item manager may have an incentive to unofficially increase the customer service level by overstating requirements in an attempt to ensure high SMA percentages.

D. INVENTORY COSTS

While the reasons for maintaining inventories will vary according to the type of business and its location, the costs associated with inventory maintenance are fairly typical for all inventory systems. These costs commonly include:

1. the administrative cost of performing the inventory function;
2. the cost of inventory on-hand;
3. inventory carrying cost (expressed as an annual percentage of the dollar value of the average on-hand inventory - this cost can be considered the opportunity cost of investing money in inventories and so the percentage used is the current investment rate);
4. warehousing costs;
5. receiving and shipping costs;

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[5] See R.H. Ballou, *Business Logistics Management: Planning and Controlling*, 2nd ed., Prentice-Hall, Inc., 1985, for a detailed explanation of the statistical formulas used to determine safety stock levels.

6. transportation costs;

7. order processing, this is the fixed and variable costs associated with placing an order; and

8. shortage costs associated with not being able to supply the customer with what he needs when he requests it.

In determining applicable costs, the inventory system should be divided into fixed costs and variable costs. According to DODI 4140.39 (1970), fixed costs are those which will remain constant should 50% of the workload be eliminated. For example, the cost of the mechanized system used for selection of items in a reorder position should be considered fixed.

Variable costs should include only those costs that are variable as a function of the number of orders placed. Included as variable costs are costs for direct labor, supporting costs, certain supervisory costs and average costs determined necessary to achieve the functional workload. (DODI 4140.39, Encl 3, 1970, p. IIIA)

Some of the most important variable costs in the inventory decision are holding costs. Holding costs reflect the monetary penalty attached to keeping inventory in anticipation of future use. The costs to hold are assumed to be linear to the amount of on-hand inventory held and are thus expressed as a cost per year per dollar of average value of on-hand inventory. (DODI 4140.39, Encl 4, 1970, p. 1-3)

In a study conducted by LaLonde and Zinszer (1976), the researchers attempted to determine appropriate factors for computing the holding costs experienced by producers of industrial goods. The percentages determined are listed in Table I.

Table I: Inventory Cost Percentages Presented by LaLonde and Zinszer

Element	Value
Administrative	0.7%
Transportation	5.9
Inventory Carrying Costs	13.7
Warehousing	2.9
Receiving and Shipping	0.2
Packaging	2.0
Order Processing	1.0
Total	26.4%

While the functions of the Navy ICP's could be closely equated with the functions of producers of industrial goods, the Navy has chosen to use percentages which differ considerably from those presented by LaLonde and Zinszer. These percentages are established at the service level and are listed in NAVSUP PUB 553 (1988). Table II presents the percentages used by the Navy.

Table II: Inventory Cost Percentages Used by the U.S. Navy

Element	Value	
	Consumables	Repairables
Investment Costs	10%	10%
Warehousing Costs	1	1
Obsolescence Costs	10	10
Theft and Shrinkage	2	0
Total	23%	21%

A possible explanation for the difference between the inventory cost percentages estimated by LaLonde and Zinszer and the percentages used by the Navy could be the last three items listed in Table I. This researcher feels the costs associated with receiving and shipping, packaging, and order processing are not part of the inventory storage process and should be excluded from the total cost percentage. Adjusting for these three elements results in an inventory cost percentage of 23.2% which is more comparable to the percentage used by the Navy.

Costs to consider in determining the cost to order material will be those variable direct labor and support costs which begin with the issue of the requirements notice, through the mailing of the contract or order and will also include processing the physical asset into the proper warehouse location after receipt from the contractor. DODI 4140.39 (1979) states that the average contract administration costs will also be part of the cost to order an inventory item, but this value is rarely, if ever, used because it is so difficult to accurately quantify. Additionally, the costs to order material should be updated at a minimum every two years and at least as often as general schedule civilian wages change. (DODI 4140.39, Encl 3, 1970, p. V)

Although most of the cost factors are established at the service level, the Navy ICP's are free to establish their own ordering costs. As of September 8, 1989, ASO began using the costs contained below in Table III as their ordering costs.

Table III: ASO Administrative Ordering Costs

Type of Order	Cost
Purchase Order	$240.97
Small Basic Ordering Agreement	$736.36
Large Basic Ordering Agreement	$736.36
Competitive Bids	$584.14
All Others	$1,182.63

Among the problems identified by the studies discussed in Chapter II, one problem that has continually been reported is the failure of the services to make comparisons of the costs to hold inventory versus the costs to terminate contracts. (Chapman, 1988, p. 12) Determining the total costs incurred from holding inventory is subject to management discretion and are currently established at the service level, therefore the ICP's lose control of this function.

E. THE NAVY INVENTORY SYSTEM

The U.S. Navy maintains a three tier supply/inventory management system. The lowest level of these tiers is the consumer retail level. At this level, the supply support is provided by the end users themselves. The inventories located at this level consist of a limited quantity of stocks maintained by the end user to accomplish daily operations.

The next tier is called the intermediate retail level and consists of numerous stockpoints located throughout the world. These stockpoints are responsible for physically

maintaining inventories which are "pulled" down to the consumer retail level as material is needed.

The third and final tier of Navy supply support is the wholesale inventory level. The control and management of wholesale level inventories are the responsibility of the item managers located at the two Navy inventory control points. However, the actual inventories are commingled with the intermediate inventories located at various intermediate retail stockpoints.

The item managers are responsible for ensuring that wholesale level stocks are constantly available to replenish depleted inventory at the intermediate level stockpoints. They accomplish this function by statistically forecasting the amount of inventory the intermediate stockpoints are likely to need based on historical demand patterns and the projected needs of the users.

While the inventory manager theoretically knows where all inventories are located and has the unrestricted right to redistribute material to meet demands as they arise, each inventory manager may have as many as 2,000 separate line items that he is responsible for maintaining on a continuous basis. This results in many items being neglected until an adverse situation arises and then having the item manager attempt to correct the situation by expediting requisitions.

Unlike the consumer and intermediate retail inventories, wholesale inventories are "pushed" down to the appropriate stockpoints before the stockpoint actually recognizes a need for the items. This is accomplished through the Navy's automated data processing system called the Uniform Inventory Control Program (UICP). The item manager

determines how much of an item a particular stockpoint needs based on the historical information stored in the UICP database and planned program requirements obtained from NAVSUP and NAVAIR.

The Navy's UICP supports an inventory policy that is theoretically based upon the assumptions and conditions of a Q-system using the Wilson EOQ model. However, due to the large volume of items that are maintained by the Navy, the system actually performs as a modified Q-system. The information used to determine requirements is obtained from the database at a determined time and stored as a batch file for use in an inventory analysis at a later date. This results in a continual rather than continuous review of the inventory position. Also, although the EOQ model is used, many of the assumptions, such as constant leadtime, demand, and unit price, are all violated in the actual UICP application programs. Unless closely monitored, these two deviations from the Q-system's methodology can greatly affect the output data from the UICP.

F. WHOLESALE REQUIREMENTS DETERMINATION

The overall purpose of requirements determination is to combine the input from the UICP data files with the expertise of the item manager to provide spare part support to fleet customers by anticipating their needs. The objectives of requirements determination are to determine:

1. future usage;
2. best method of supply;
3. leadtime;

4. stockage objectives; and
5. economical allocation of material.

In order to provide this support, the item manager makes use of several application programs contained within the UICP. The major UICP programs used are discussed below. (NAVSUP PUB 553, 1988, pp. 3-27 to 3-48)

1. Cyclic Levels and Forecasting (D01) Application.

This program is run quarterly to compute the future wholesale demand rate for established items on each National Item Identification Number (NIIN). It is also designed to calculate the reorder level, economic order quantity, and safety level for each NIIN to allow SDR to develop a basic buy requirement.

In executing its functions, CLF obtains input data from three separate files contained within the database. These are the Master Data File (MDF), the Repairables Management File (RMF), and the Inventory History File (IHF). In addition to the above functions, CLF also automatically updates the MDF and RMF with the new forecasts and inventory requirements and the IHF with the past quarter's observed requirements, develops trend indicators for items which may be experiencing increasing or decreasing demand or leadtime, and highlights significant change conditions for item manager review.

2. Supply Demand Review (B10) Application.

After the CLF application has been run, this program uses the updated information files to compute the net deficiencies or excesses which may exist in the wholesale

inventory levels. The program will then either recommend or initiate one of the following: 1) a procurement, 2) a disposal recall, or 3) a termination.

The question that SDR attempts to answer is whether assets balance requirements on an item by item basis. If the assets for an item are deficient, SDR will take one of the following actions, as applicable:

1. generate a disposal recall recommendation if assets are currently being disposed of;
2. initiate a procurement if the dollar value is below a predetermined amount; or
3. provide the item manager with a procurement recommendation.

When evaluating items for termination, SDR considers the protection parameters established by the ICP s. If the assets exceed these protection levels, SDR will automatically generate a termination recommendation to the item manager for on order excess. Protection levels are set as follows:

1. for contracts: Reorder Level + Fixed Requirements + The greater of EOQ or 8 quarters attrition.
2. for purchase requests: Reorder Level + Fixed Requirements + The greater of EOQ or 2 quarters of attrition.

For the triggered items having assets exceeding requirements, a check is made first for possible terminations of purchase requests and then awarded contracts. Simply put, if assets exceed all possible requirements in the files plus anticipated attrition demand to the end of an ICP determined period <u>and</u> the dollar value is greater than an ICP set

termination value, a recommendation is made to the item manager to initiate a termination. While SDR will make a recommendation of which purchase orders or contracts to terminate, it is the responsibility of the item manager to ensure that any terminations are ranked in order of type and time precedence.

SDR was designed to be run on a daily basis to imitate a continuous inventory review, but the enormous volume of items managed at the ICP's makes this an impossibility, even with automated data processing equipment. While the ICP's have attempted to run SDR on a bi-weekly basis, the current policy at ASO is to run SDR as required by the senior management. This effectively reduces the system from a continuous review system to a continual review one.

3. Stratification (B20) Application.

Stratification is designed to be run semiannually, by March 31 and September 31, to produce data that provides a long range look at projected excesses and deficiencies. The primary inputs for the Stratification process are the various forecasted values from the MDF and RMF plus any program data, planned requirements from the Planned Program Requirements (PPR) File, contract and repair data from the Due-In/Due-Out File (DDF), and Prepositioned War Reserve Material Requirements (PWRMR's).

The application projects inventory requirements for up to eight quarters, applies the opening assets to those requirements, and calculates deficiencies or excesses to those requirements by simulating procurements and repairs. The objective is to have this process coincide as closely as possible to the policies and procedures governing the daily inventory management at the ICP's.

Some of the information provided as a result of these calculations are:

1. summaries for budget preparation;

2. listings of items that could have a significant adverse effect on budget formulation and execution if errors exist in the database;

3. identification of assets that may be redistributed because they are no longer needed as PWRMR assets; and

4. identification of assets as disposal candidates because they have been identified as having potential excesses.

More specifically, Stratification can be seen to serve three purposes: 1) the means of computing various requirements levels and arranging them in priority, 2) the basic tools for computing budget requests, and 3) a way to identify items for potential disposal.

4. On-Line Requirements Determination Model (Recalc).

The applications contained within the UICP were all written under the assumption that the system would be run as a continuous review model. Since the abundant volume of data which must be used in the applications results in the system being run as a periodic review model. ASO developed the Recalc application program that more accurately reflects real time information. This program is designed to be used by the item managers and allows them to review SDR and Stratification recommendations using current data.

As currently written, the program allows the item manager to review requirement levels and termination decisions for consumables and repairables separately to determine if the decisions are still justified when real time data is used in place of the previous data

which may be obsolete. The advantage to the program is that it allows the item manager to input data that he may have received after the other applications were run. It also allows the item manager to interject his or her expertise into the calculation by setting protection levels or program requirements at levels different from those contained in the UICP database.

Unfortunately, there is no means of preventing the item manager from making unauthorized manipulations to the input data. If an item manager wants to increase the SMA being measured or protect the procurement of an item, he can change the input values to make a requirement appear valid.

G. SUMMARY

This chapter has described some of the various aspects of inventory management. Areas discussed in detail included inventory systems, the Wilson EOQ model, service level and safety stock, and inventory costs. It then provided an overview of the U.S. Navy's supply system and discussed the procedures used by the Navy in the requirements determination process. Chapter IV will provide an analysis of the Chapman Termination Model. The benefits which can be derived from its use, as well as the problems associated with the model, will be discussed.

IV. ANALYSIS OF THE CHAPMAN TERMINATION MODEL

A. INTRODUCTION

This chapter provides an analysis of the decision variables and parameters used in the Chapman Termination Model. The Chapman model was designed as a result of research conducted by Gary Chapman for his Master's Thesis and is based on the business practices of SPCC. The model is laid out as a series of steps structured in an array of decision branches. The branches followed throughout the decision process depend upon the decision maker's responses to the questions located at decision points. This structure results in many of the model's 89 steps presenting identical questions, instructions, or recommendations to the decision maker.

The next section of this chapter discusses the assumptions this researcher believes Chapman made in designing the model and how these assumptions affect the effectiveness and efficiency of the model. The last two sections analyze the decision variables contained in the Chapman model that this researcher feels are applicable and inapplicable, respectively, to the termination decision. The actual variables used in the Chapman model are contained in Appendix B of this thesis as decision steps and in Appendix C as logic flow diagrams.

B. ANALYSIS OF THE ASSUMPTIONS

This researcher feels the Chapman Termination Model is flawed by the assumptions which Chapman appears to have made when formulating the model. These assumptions are:

1. The item manager and buyer are familiar with one another and interact on a frequent basis.

2. The item manager and buyer understand the policies, rules, and regulations governing the performance of each other's duties.

3. Termination decisions and the implementation of these decisions are made within a short time span.

4. Information concerning technical concerns, supplier availability, and operational obligations are readily available to the item manager and buyer.

5. Item managers and buyers have an incentive to work together to make the most economical decision for the service.

These assumptions appear to take many of the organizational facets of the ICP for granted since they assume extensive interaction between departments. They also appear to introduce a degree of simplicity into the work performed at the ICP's. The problems which these assumptions foster are discussed below.

1. <u>Assumption #1</u>: The purpose of the Chapman Termination Model is to aid the item managers and buyers at the ICP in determining whether or not a contract for items in long supply should be terminated. Many of the steps contained in the model necessitate a close interaction between the item manager and buyer in order to provide responses to the questions asked. However, item managers and buyers do not work

together as closely as the model assumes and, in many instances, may have never met one another.

When a requirement to reorder material is identified, the item manager submits a purchase request to the appropriate purchasing department or technical section, not to a specific buyer. A buyer will be designated to make the procurement after the purchasing department receives the purchase request. Unless there is a problem with the information on the purchase request, the buyer will initiate the procurement without ever communicating with the item manager. The procurement will then continue uninterrupted unless the material becomes long supply or the item manager needs to expedite the procurement to meet a customer's needs.

A typical procurement may take several months or years during which time a requirement to order additional material may arise. When this occurs, the process of submitting a purchase request is again conducted with the result being that a different buyer may be tasked with making the next procurement. This results in the item manager having to interact with more than one buyer for the same item and adds unnecessary confusion to the procurement.

Additionally, personnel fluctuations caused by promotions, transfers, and retirements may result in either the item manager, buyer, or both changing prior to the procurement cycle being completed. This would again result in the item manager or buyer working with an individual whom they do not know.

2. Assumption #2: The workload of the average item manager and buyer greatly limits the amount of follow-on education and training that either may receive in his

specialty. This is an unfavorable situation because the statutes, regulations, policies, and procedures affecting both inventory management and procurement are extensive. The average item manager or buyer may barely be able to keep up with the most current information they need to perform their duties. Attempting to become familiar with or understand the rules and procedures that apply to other functional areas is an increased burden that would reduce the individual's ability to perform his primary duties.

For this reason, item managers and buyers do not have a thorough understanding of the requirements and regulations that the other must follow. The item manager does not understand the Federal, departmental, and service regulations that the buyer is required to follow and so does not understand why it takes so long to award a contract or why a contract cannot simply be changed to reflect the changed requirements. Likewise, the buyer does not fully understand the nature of requirements determination and so does not understand why the item manager may request increases or decreases in the quantities being procured. This often leads to misunderstandings between the two and can result in contracts being erroneously terminated and reinstated.

3. <u>Assumption #3</u>: GAO and the DODIG have cited timeliness in identifying and processing terminations as a problem experienced by each of the services. The timeliness of identifying potential terminations is a function of the UICP applications and is being considered during the UICP resystemization. However, one factor which may increase the time it takes to make a contract termination decision is the excessively long time needed to obtain information regarding the percentage of the contract that has been completed and the costs the contractor will incur if the contract is terminated. As

discussed in Chapter II, there is currently a DOD-wide problem with obtaining this type of information since the services have no guidance on who is responsible for its collection or how it should be collected. The current reliance on contractors to provide this information may result in untimely responses from the contractor and the acceleration of production schedules by the contractor in an attempt to incur as many costs and profits as possible.

4. Assumption #4: The Chapman model assumes that item managers and buyers have access to a variety of information from various internal and external sources. However, much of the information required by the model to make a decision would not be readily available to either the item manager or the buyer. While some of this information could be obtained from sources internal to the ICP, its collection would require additional coordination and time. This results in the termination decision no longer being a quick process, but rather a long and cumbersome one. Additionally, the requirements for the item may once again change during the added time needed to obtain this information and make a decision.

5. Assumption #5: Item managers and buyers are evaluated using different performance measurements. For the item manager, one of the most important measurements is his ability to support the customer while keeping excess material to a minimum. For the buyer, an important measurement is his ability to procure the correct material as quickly and efficiently as possible. When a requirement changes, the item manager and buyer become at odds with one another. The item manager wants the quantity of material being procured to be adjusted so that neither a shortage nor an excess

occurs. But this will require the buyer to modify the contract to reflect the new requirements which will result in increasing the length of the administrative leadtime for the procurement.

While every Federal employee should feel obligated to make an effort to save the taxpayers' dollars, the fact is that performance measures may often get in the way of this objective. If an employee feels that he will be adversely effected by his actions, human behavior may result in his acting in his own best interest rather than the best interest of the organization. Therefore, these measurements can adversely effect termination decisions if an individual, either an item manager or a buyer, avoids the best decision in an attempt to influence the outcome of his performance measurement.

C. ANALYSIS OF THE INAPPLICABLE DECISION VARIABLES

The Chapman Termination Model is designed to allow the item manager or buyer to proceed through the model in a step by step fashion until a decision point is finally reached. The structure of the model directs the user to the proper branches based on the answers to preceding questions. While this structure allows the user to efficiently arrive at a decision while avoiding irrelevant questions, its effectiveness depends largely on the user's ability to answer the questions posed. For this reason, the questions asked must be relevant, succinct, and answerable.

However, many of the questions asked in the Chapman model appear to be neither relevant, succinct, nor answerable by either the item manager or buyer. This section analyzes the major decision variables used in the model, provides an explanation of the

variables, and then evaluates the applicability of variables. As mentioned in the introduction to this chapter, many of the decision variables are listed in multiple steps throughout the model, but each will be discussed only once.

a. Is the item identified as excess?

This question is not necessary for the decision process. If the item manager is in the process of making a termination decision, a determination that the item is in excess of requirements has already been made. This determination would have been made using one of the requirements determination applications discussed in Chapter III and then verified with the Online Requirements Determination Application. If there was no excess, the item manager would allow the procurement to continue without intervention.

b. Are there outstanding procurement actions, either purchase requests or contracts?

This question is not necessary for the decision process because the item manager would not initiate a termination calculation if the Consolidated Stock Status Report (CSSR) generated by the requirements determination applications did not list outstanding procurement actions. The CSSR lists all awarded contracts and purchase requests.

c. Compute the dollar value of excess material.

This computation is performed by SDR, Stratification, and the Online Requirements Determination Application and generated on these applications' respective reports. This results in the item manager already having this information and so this question is not necessary.

d. Is a no cost settlement acceptable to the contractor?

The answer to this question would not be readily available unless the procurement was experiencing problems other than long supply. As discussed in Chapter II, a no cost settlement rarely occurs and when one does, it is due to reasons other than the material being in long supply. The probability of a contract for long supply material being terminated with a no cost settlement is extremely low and so this question should be excluded from the termination decision.

e. Can the contract be terminated for default?

The logic discussed in question (d) is also applicable to this question.

f. Is the excess the result of a Life-of-Type buy?

A Life-of-Type buy is a one time procurement of sufficient quantity to meet all of the expected demand an item will experience up to the time it reaches the end of its life cycle and is phased out of the inventory. A Life-of-Type buy is annotated in Data Element Number (DEN) B070 within the Master Data File so that it is considered when the SDR and Stratification applications are run. If the item manager fails to "flag" the Master Data File at the time the Life-of-Type requirement is originated or if the "flag" is inadvertently removed, the item manager will have to rely on his paper files to determine if the item is a Life-of-Type buy. If he failed to make a note to his paper file, it is highly unlikely that he will be able to identify the item as a Life-of-Type buy at this time.

g. Are applicable weapon systems in use by the U.S. military services (active or reserve) or by foreign governments?

This question is somewhat confusing. This researcher assumes the model is asking if there are applicable weapon systems for which the secondary item is a component part. If the weapon system was not in use by any of the activities listed, there would be no requirements generated for the secondary item since the information concerning the weapon system and its components would have been removed from the inventory database. If the items are applicable to another weapon system, the requirement would have been generated based upon the previous demand, program requirements, and operational quantities of that particular weapon system.

h. Is the item itself obsolete?

Determining whether or not an item is obsolete would require the support of technical personnel. If the item was in fact obsolete, the length of time it would take to obtain this information from technical would probably make the inclusion of this question detrimental to the model. If an item were to become obsolete after the procurement was initiated, it would not be identified as excess until new requirements began to be received for the new item. As an additional measure to protect against this situation, ASO production contracts contain a provision that makes contractors responsible for providing the latest version of all items being procured.

h1. Is there a commercial alternative which would fulfill the form, fit, and function of the obsolete item?

The item manager would not have access to this information. If the item was not a commonly procured item, the procurement department would need to conduct a market analysis to determine if commercial alternatives were available and then the

technical section would need to conduct a study to identify the feasibility of using the commercial product in place of the original item. Once again, the time incurred gathering this information may make the question detrimental to the model.

i. Was the procurement action under examination for potential termination based upon a defective, faulty, or imperfect specification rendering the item unusable for its original purpose?

This question is not relevant to the termination decision being made by this model. Assuming the above question was answered in the affirmative, it would require that a termination for convenience be made to stop the procurement of unsuitable material regardless of whether or not the item was excess. If the bad specification was discovered by the technical section prior to the purchase document being sent to the procurement department, then the specification would have been corrected prior to a contract being awarded. Therefore, this issue would not arise unless a contractor or quality assurance inspector discovered the bad specifications either during preaward solicitations, contract performance, or acceptance inspection. If bad specifications were discovered, the contract would either be modified to correct the specification or terminated for convenience as a result of the bad specifications, not because the item was identified as excess.

j. Has there been a change in the applicable engineering support method to be used for this item (from repairable to consumable, from field level to depot level repair, etc.)?

Item managers are kept informed of any changes to an item's support method by the NAVSUP and NAVAIR technical staffs. These technical staffs determine when a change is necessary and are responsible for informing the applicable item manager when

a change in the engineering or logistical support for an item is forthcoming. This is usually done via naval message, but most staffs will also contact the item manager directly by telephone. Therefore, the item manager should have already accounted for this change by modifying the planned program requirements data in the Master Data File or in the Online Requirements Determination Application if the information was received after requirements were initially determined. In either case, the item manager will not be able to answer this question if the technical staff fails to inform him of the impending change or if the change was inadvertently deleted from the Master Data File and the item manager failed to annotate the change in his paper file.

j1. Will the applicable hardware systems command buy the item from the Navy Stock Fund?

Whether or not the applicable hardware systems command will fund the procurement of the item is irrelevant. Items that are either excess or long supply are above the allowed requisition limit and therefore, are not authorized. Additionally, part 49.101 of the FAR (1987) states that all long supply material is required to be terminated if it is in the best interest of the government to do so.

k. Was this item procured under a Spares Acquisition Integrated with Production (SAIP) program?

Whether or not an item was procured under a SAIP program is not annotated in the Master Data File database. Due to the long leadtime associated with the procurement, the UICP application programs are not able to recognize material being purchased under a SAIP program as planned requirements and so the material will always appear as excess.

This makes it necessary for the hardware systems command to inform the item manager of all SAIP buys.

k1. Was the weapon system the item was used in deleted, retired, or otherwise removed from the Navy's inventories?

Only the items and quantities applicable to a weapon system being produced are purchased under a SAIP program. The probability that a weapon system currently being produced would be deleted, retired, or otherwise removed from the Navy's inventory is extremely slight. If the program is being reduced or canceled, the hardware systems command will need to inform the item manager of these events. Therefore, this question does not appear to be relevant to the item manager's decision.

k2. Are there any other weapon systems applications for this item?

This question is not necessary because the requirements for an item are based on the total demand previously experienced and expected for the item. If the item was used in other weapon systems, the application programs would consider the total number of and demands against these systems when computing the material requirements.

k3. Did the item's program suffer a major delay or was it reduced?

If the item's program suffered a major delay or was reduced, the item manager would not have access to this information unless the weapon system's sponsor informed him or there was substantial media attention given to the event. As discussed under question (k) and (k1) above, the item manager will not take actions against excess items that are procured under a SAIP program because he assumes the buy and excess position are valid.

l. Has there been a change in the funded planned program requirements since the last SDR?

This question is not necessary. If any changes occurred prior to the requirements determination initially being made, the information in the Master Data File would have been updated by the Cyclic Levels and Forecasting Application. If the changes occurred after the requirements determination was made and the item was identified as excess, the item manager would input the new information when running the Online Requirements Determination Application.

m. Is the item's demand trending upward or downward?

Demand trends are captured by the Cyclic Levels and Forecasting application. This application includes a set of filters established by each ICP which identify when an item's demand is beginning to trend either up or down and brings this situation to the attention of the item manager. The item manager will take action at that time to either reconcile these trends or allow them to be incorporated into the Master Data File database and used in the UICP application programs. Therefore, trending is not a factor in the termination decision.

n. Is the item classified as hazardous material?

This question is not relevant to the termination decision. Whether or not an item is classified as a hazardous material has nothing to do with the economic decision to terminate a contract for excess material. Chapman feels this question is relevant because of the increased costs associated with storing hazardous material. However, there is no

way for the item manager to quantify this cost and make a realistic determination using it.

n1. Can the average customer waiting time be met by one stock point on each coast?

Although the item manager must take average customer waiting time and transportation leadtime into consideration when determining where to locate stock, this question has nothing to do with the termination decision. The determination that the material is excess is based on the information contained in the Master Data File database. The demand and program requirements will be the same regardless of whether the item is located at one or multiple stockpoints.

n2. Are existing hazardous material storage areas available in adequate size for stocking at a single point on each coast?

The logic discussed in question (n1) is also applicable for this question.

o. Does the item have a shelf life?

This question is relevant to the termination decision only if there is a possibility that the item's shelf life will be reached prior to the item being used. This situation would result in the occurrence of additional costs from disposing of items whose shelf life has expired. However, the item's shelf life is considered when the initial levels are set during the Cyclic Levels and Forecasting Application. If the shelf life of an item were to change after the procurement decision was made, the item manager would adjust the shelf life (DEN C028) and reevaluate the item's position using the Online Requirements Determination Application.

p. Do all stockpoints have adequate and proper storage facilities for the quantity of items which will be stored there?

While this should be a concern of the item manager, it is not relevant to the termination decision. The stockpoints would have several options to deal with physically storing the material if it has not been determined to be excess, but these options are not relevant to this study. However, if the material is excess, the item manager must take action to reduce the assets.

q. Is the item's IMEC 3 or 4?

The Item Mission Essentiality Code is a code assigned to an item that designates its military importance to the operation of the item's end component. Chapman has placed importance on an item's IMEC because he feels that all items, regardless of their criticality, are competing for the same scarce dollars. However, this is not the case.

During the initial provisioning of spare parts for a new weapon system, the services are required to provide the maximum support possible within available resources while minimizing the time required to respond to a customer's need. DOD has allowed the services the flexibility to establish their own requirements determination models with the caveat that the financial constraints do not exceed those that a DOD model would have established. This leeway has resulted in the ICP's using different models for initial provisioning requirements determination, but the use of the IMEC is the same in both models.

In these models, the allowable quantity for a particular item depends on the available fiscal resources, so these items are in fact competing for dollars based on their

projected failure rates. However, this process applies only to the initial procurement of secondary items. The termination decision model should be concerned with the provisioning of items, but their reprocurement, which is based on actual usage.

D. ANALYSIS OF THE APPLICABLE DECISION VARIABLES

While this researcher believes the majority of the decision variables used in the Chapman model are irrelevant to the termination decision or too difficult to answer on a timely basis, there are a few variables which are applicable. These variables are discussed below using the same format as the preceding section.

a. Can the item be used as government furnished equipment (GFE) or government furnished material (GFM)?

As discussed in Chapter II, an attempt is made to use excess items as either GFE or GFM in current production contracts. The fact that the ICP's and hardware systems commands have difficulty implementing this process should not impact on the inclusion of this variable in the termination decision. The problems associated with this procedure are not the item manager's concern, but he should be aware that there are potential difficulties with providing long supply assets as either GFE or GFM.

b. Can the material be used for FMS?

The logic discussed in question (a) is also applicable to this question.

c. Is the dollar value of the excess greater than $2,000?

The Federal Acquisition Regulation (1987) specifies that a contract valued at less than $2,000 should not be terminated since the costs to terminate would probably be more

than the cost of the original contract. This reasoning is valid and so this question should be included in the termination decision. However, consideration should be given to increasing the dollar value to an amount that more accurately reflects inflationary trends and the administrative costs incurred when a contract is terminated.

E. SUMMARY

This chapter has focused on the strengths and weaknesses of the decision variables used in the Chapman Termination Model. The assumptions this researcher believes were made when designing the model and the problems these assumptions cause in the effectiveness and efficiency of the model are discussed. This researcher then provided a list of the variables which should be excluded from the model because they are either irrelevant or too complicated . inclusion in the model. The variables contained in the model that are applicable to a termination decision were then discussed. The next chapter will provide an analysis of the NAVSUP Contract Termination Model.

V. ANALYSIS OF THE NAVSUP TERMINATION MODEL

A. INTRODUCTION

The NAVSUP Contract Termination Model is designed to measure the costs to terminate a procurement contract against the costs avoided by termination.[6] The costs to terminate are the contractor termination fees, the administrative costs to reaward a contract in the future, and the effects of inflation on the future cost of material. The costs avoided are the holding costs which include the interest on the funds deobligated after termination, the costs of storing the material, and the costs associated with disposing of obsolete material. In order to compute the holding costs, the length of time from the contract termination until a reorder will be necessary must also be determined.

The NAVSUP model will recommend a termination when the cost avoidances are greater than the termination costs with the result being a positive net savings. In order to determine the positive net savings, the model considers all contracts and may recommend the termination of all or part of a contract. This results in the recommended termination quantity being the quantity which will provide the largest net positive savings from all existing contracts.

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[6] The information contained in this chapter is drawn from the Functional Description/System Specification, FD/SS-PD81, *Contract Termination Model*, FMSO Document No. N9322-D81-9095, January 30, 1990, and a paper titled "Termination Model" presented by Kathy Reynolds, FMSO Code 9322, on June 9, 1989.

NAVSUP's original intent was to provide this termination model to the ICP's for use on personal computers until FMSO could incorporate the model into the Functional Description PD84 which is part of the UICP system. The Navy's goal was to have the model written using a computer program that would provide flexibility and ease of maintenance. However, since the model was to be eventually incorporated into PD84 during the UICP resystemization effort, FMSO developed the model using both third (COBOL) and fourth (FOCUS) generation languages. COBOL provides the model with the capability to interface with the database contained in the UICP, while FOCUS provides the user with the ability to easily communicate with the system using a less procedural structure.

The incorporation of COBOL allows the model to be run in one of two main functional modes - interactive and batch. The interactive mode consists of an online function for screen input and output, a data processing function and a hard copy output function. The batch mode consists of a data extraction function, a data processing function, and a hard copy output function.

The major difference between the interactive and batch modes is the manner in which the data needed for processing is input. In the batch mode, the Contract Termination Extract Program (PPD81AA) will extract the required data from the Primary CSSR File and Secondary CSSR File and place the data into a file called the Contract Termination Extract File. These CSSR files contain the supply actions and/or interrogations generated during SDR, the due-in/due-out information, planned program requirements, back order data, and other NIIN and contract related data needed by the

termination model when run in a batch mode. When the extract file is created in the SDR process it is called PFD81AA1 and when it is created in the Stratification process it is called PFD81AA2. In the batch mode all NIIN's which are candidates for termination are automatically placed in this file.

In the interactive mode, the required data may be input by the user via CRT screens or the user may select the required data from the extract file created in the batch mode. An advantage to the interactive mode is that it will allow the user to modify the input data. However, a disadvantage is that only one NIIN can be processed at a time in the interactive mode.

Both the interactive and batch modes have the same processing requirements when run. A driver program passes predetermined parameters along with each NIIN and its contracts, one contract at a time, to a "black box" program. These contracts are processed based on the purchase document date, with the contract having the most recent date being processed first.

The black box program determines if there are excess assets equal to or greater than the termination quantity which will result in a net positive savings. If there are not sufficient excess assets, no contracts are processed and the processing for each NIIN will be complete. If sufficient excess assets do exist, the annual recurring and non-recurring demands, administrative leadtimes, and procurement cycle order quantities will be determined for the NIIN.

Processing for each contract will then begin by computing the percentage of elapsed production leadtime and the maximum contract termination quantity applicable to each

contract. The process then calculates the net savings for the termination quantity .,puted for each contract until the maximum contract termination quantity is reached.

The black box process will recommend a termination if there is at least one contract termination quantity which results in a net positive savings. If more than one such quantity exists, the model will recommend either the largest contract termination quantity which results in a net positive savings or the contract termination quantity which results in the largest net savings based on the parameter settings. The recommended termination quantity for the NIIN will be the sum of the recommended termination quantities for the contracts associated with the NIIN. An important factor in this summation is the model's assumption that the entire quantity of the most recent contract will be terminated prior to terminating any quantity from contracts with earlier purchase document dates.

B. MAJOR COMPONENTS OF THE MODEL

The termination model contains four components which are used in several of the various equations. The degree of confidence exhibited in accurately determining the values of these components reflects on the reliability of the model as a whole. Each of these components is discussed below and the time lines for the various elements contained within them are illustrated at the end of this section in Figure 4.

1. Time Until Reorder (T_{RL}).

This component is the estimated length of time, in quarters, that it will take to reach the item's reorder level after a termination is made. The value of this time period is used in each of the holding cost computations discussed later and is calculated using Equation

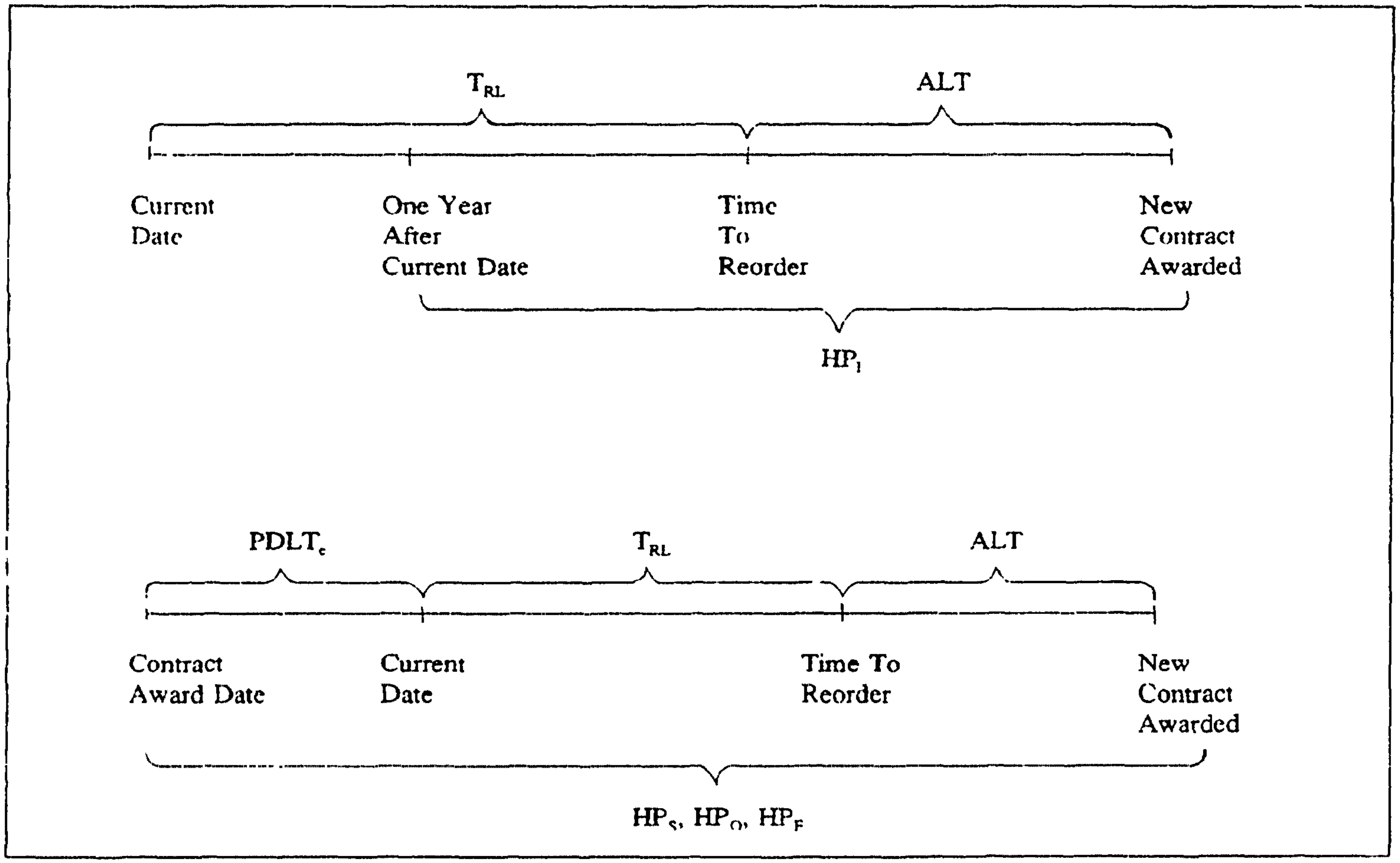


Figure 4: Time Lines for Holding Periods

2 below. In this calculation, purchase requests are not intended to be included in the total assets, so the item manager must ensure these purchase request quantities are excluded from the calculation, but considered when reducing long supply assets. If these purchase requests are not considered, awarded contracts may be canceled while purchase requests continue to be processed.

$$T_{RL} = \frac{TotalAssets - LTRequirements - TermQuantity(Q_T)}{AnnualRecurring + AnnualNonrecurringDemand} \qquad \text{Equation 2}$$

2. Percentage of Elapsed Production Leadtime ($\%PDLT_e$).

As illustrated in Equation 3, the elapsed production leadtime is the difference, in quarters, between the current Julian date and the contract award date. This value is used in calculating the percentage of contractor termination fees and the storage, obsolescence, and inflation holding periods. While the actual percentage of completion for a contract should be available from various sources such as the contractor and the administrative contracting officer, the model negates the need to obtain this information by simply calculating the percentage of work that should be completed according to the estimated production leadtime and the amount of time which has elapsed since the contract was awarded. Although this makes the calculation easier for the model, this simplification could result in errors in the cost calculations if the contractor is substantially ahead or behind the established schedule. Also, ASO has recently discovered that the estimated production leadtime for many of the items it manages is overstated and should be reduced significantly. If the production leadtime is overstated, as it often appears to be, the costs

to terminate will be underestimated and more than the optimal quantity would be terminated. Conversely, if the production leadtime were to be underestimated, less cost will be computed and a lesser quantity than optimal would be terminated.

$$\%PDLT_e = \frac{CurrentDate - ContractAwardDate}{PDLT} \qquad \text{Equation 3}$$

3. Percentage of Contractor Termination Fees.

The percentage of contractor termination fees is an estimate which is based upon the percentage of elapsed production leadtime and is combined with the dollar value of the termination quantity to calculate the dollar value of the contractor termination fees. There are four primary methods for computing the percentage of contractor termination fees using the percentage of elapsed production leadtime. The computation options "A", "B", "C", and "D" represent these four possible methods. The following list defines each of these options:

1. Option A - from a table of multipliers contained within in the run parameters which matches a %CTF with a $\%PDLT_e$;
2. Option B - from the square root of the $\%PDLT_e$ (the default);
3. Option C - exact equality, if the information is available; and
4. Option D - from the cube root of the $\%PDLT_e$.

Since these values are based on the percentage of elapsed production leadtime, they can be effected by the same factors discussed above. There is a fifth option, Option "E",

which indicates that the CTF will be input by the model as a run parameter. The percentage of contractor termination fees for Option E will be computed from known contractor termination fees, the replacement price of the termination quantity, and the candidate contract termination fees.

4. Holding Periods.

There are four holding periods used in the various computations. These holding periods are computed based on the assumption that if these items are procured, they will be excess material until they are used at some future date. Each of these holding periods are discussed below.

a. Interest (HP_I)

The interest holding period is the average length of time, in quarters, that the stock of excess material will be held before it is used. The assumption of the model is that this time period equates to how long it will take until the funds invested in the procurement will be recovered through use of the material. This time period is an estimate based on the subjective values of T_{RL} and the administrative leadtime needed to award a contract. Because of the subjective nature of these elements, HP_I could very possibly be estimated to be lower than it eventually turns out to be due to a number of variables such as a change in procurement policy, loss of qualified vendors, and a reduction in demand. A lower estimate than actually experienced would lessen the investment cost and bias the determination towards continuing the procurement and a higher estimate would increase the investment cost and bias the determination towards terminating the procurement. For these reasons, the holding period must be evaluated as

accurately as possible. Equation 4 illustrates the calculation for the interest holding period.

$$HP_I = T_{RL} + \frac{ALT}{4} - 1year$$

Equation 4

b. Storage (HP_S)

The storage holding period is the average length of time, in quarters, that the stock of excess material will be stored until it is used. Like the interest holding period, it is a subjective, best guess value. If the value is set too low, the total cost to continue will be reduced. Thus, fewer contracts would be subject to termination. Equation 5 illustrates this calculation.

c. Obsolescence (HP_O)

The obsolescence holding period is the average length of time, in quarters, that the stock of excess material will be stored until it is either used or becomes obsolete. Once again, this is a subjective value. Additionally, in today's era of rapid technological breakthroughs, items may become obsolete due to new and improved products much sooner than originally projected. Equation 5 illustrates this calculation.

d. Inflation (HP_I)

Like the storage and obsolescence holding periods, the inflation holding period is the average length of time, in quarters, that the excess material will be held before it is used. This holding period is used in the calculation of termination costs instead of holding costs and is intended to account for the added costs that will be experienced as

a result of inflationary trends when reprocuring the terminated material at some future date. Equation 5 illustrates this computation.

$$HP_S=HP_O=HP_F=T_{RL}+\frac{(PDLT_e+ALT)}{4} \qquad \text{Equation 5}$$

C. TERMINATION COSTS

The costs incurred when a procurement contract is terminated can vary widely according to the type of contract, how much of the scheduled work has been completed, and the relationship between the contractor and the contracting officer. The information used to calculate the termination costs include the administrative costs incurred when terminating the contract, the inflation costs associated with reprocurement, and the contractor termination fees (CTF). Equation 6 illustrates the termination cost calculation and each of the components is discussed below.

$$TermCosts=ContractorFees+AdminCosts+InflationCosts$$

Equation 6

1. Contractor Termination Fees.

The contractor termination fees are those costs that will be paid to the contractor to reimburse him for costs incurred plus a reasonable profit for the work performed. A run parameter within the model called the "Computation Option" will indicate whether the item manager should input known contractor termination fees from similar contracts

or compute them using the percentage of contractor termination fees and dollar value of the tentative termination quantity (Q_T). Some of the factors that will affect the amount of these fees are the type of work being performed, the amount of inventory the contractor has invested in, the amount of inventory that can be turned over to the government for use in other production contracts, and the amount of scheduled work already performed by the contractor. As discussed above, contractor termination fees are based on the percentage of contractor termination fees which is based on the percentage of elapsed production leadtime so the reliability of this value will also impact upon the reliability of the contractor termination fees. Equation 7 illustrates the calculation of the contractor termination fees.

$$ContractorTerminationFees=(\%CTF)(\$Q_T)$$

Equation 7

2. Administrative Costs.

The administrative costs are those costs which are incurred as a result of the manpower expended in terminating the contract. Since different contract types will vary in the length of time to finalize the termination, these costs should be determined based upon the type of contract being terminated. The costs included in this category are the costed-out manhours needed to accomplish the termination and should include not only the personnel at the ICP, but also those personnel at the contract administration office. NAVSUP has left the task of determining the actual costs that will be used in the model to the discretion of the ICP management. Currently, the ICP's have no reliable statistics

of the actual costs that have been incurred for past contract terminations. This researcher feels the administrative costs used to value the contract award should also be used to determine the termination costs for that type of contract. The ICP's do not have a policy defining what these costs will be, but the default for this dollar value is currently set to $2,000.

3. Inflation Costs.

The inflation costs are included in the equation in order to take into account the increased costs which will be experienced when procuring the terminated quantity in the future. The inflation costs are calculated by first computing the inflation holding period using the time until reorder level after termination, elapsed production leadtime, and administrative leadtime. The inflation holding period (HP_I), along with the inflation rate (F), and the minimum dollar value of either the quantity terminated or the quantity terminated plus planned requirements during leadtime (LTPR's) will be used to compute the inflation cost. The default value of the inflation rate (F) is currently set at an annual rate of 0.04% and Equation 8 illustrates the inflation cost calculation.

However, this researcher takes exception to the inclusion of these costs into the termination cost calculation for two reasons. First, adding an inflation cost for planned requirements during leadtime (LTPR's) results in adding additional costs to the termination cost calculation. This is because the quantity being terminated, if a termination action is decided, does not include planned requirements during leadtime and so costs for items not currently on order are being considered. Second, and more important, the use of an inflation factor is not realistic. The rate of inflation is based on

current market factors and the inflation rate for a particular commodity can only be estimated relative to the current Consumer Price Index. A better method to measure the impact caused by buying in the future instead of at the current date would be to calculate these costs in terms of real dollars using the net present value of the quantity terminated. However, if this method were used, the costs to terminate would probably be less.

$$InflationCosts=(F)(HP_F)Min\begin{Bmatrix}\$Q_T\\ \$(Q+LTPRs)\end{Bmatrix} \qquad \text{Equation 8}$$

D. TERMINATION COST AVOIDANCES

If the item is determined to be in long supply yet the procurement is allowed to continue, the service will experience the normal costs associated with inventory management. By terminating the contract, the service is able to avoid these costs, but will incur the termination costs discussed above. Computing the termination cost avoidances requires determining the costs expected due to storage, obsolescence, and investing financial resources in a future event. The summation of these costs will be the total cost that can be avoided if the contract is terminated. Equation 9 illustrates this calculation.

$$CostsAvoided=InvestCosts+StorageCosts+ObsolescenceCosts \qquad \text{Equation 9}$$

1. Investment Costs.

Procuring material for use in the future is costly in terms of tying up a service's limited financial resources. Including an investment cost in the cost avoidance equation accounts for these costs. The investment costs should be calculated using an interest rate equal to the current market interest rate, the length of time the material is expected to be held before it is used, and the dollar value of the material ($R). The dollar value of the material represents the opportunity cost of continuing the procurement rather than incurring the termination costs and is therefore equal to the difference between the dollar value of the quantity terminated and the contractor termination fees ($\$Q_T$ - $CTF). The default value of the interest rate (I) is currently set at an annual rate of 0.10%. Equation 10 illustrates the interest calculation.

$$InvestmentCosts = (I)(\$R)(HP_I)$$

Equation 10

2. Storage Costs.

As discussed in Chapter III, storage costs include the costs associated with receiving and warehousing material. While many of the costs of warehousing such as buildings, utilities, and taxes are fixed costs, there are additional costs which are a function of how much material is being stored. These costs are computed as a function of the dollar value of the material and the length of time it will be held in storage before it is used. The default value of the storage rate (S) is currently set at an annual rate of 0.01% (the value used in the inventory EOQ models), but this researcher feels this value is inappropriate

for all items. The possibility of inventory shrinkage due to pilferage should result in a higher storage rate for consumable items than for repairable items. Equation 11 illustrates the storage cost calculation.

$$StorageCosts = (S)(\$Q_T)(HP_S)$$

Equation 11

3. Obsolescence Costs.

The rate at which an item may become obsolete is a function of the complexity, supply classification, and design maturity of the item. The rapid technological advances currently being made, especially in the electronics and software industries, result in the components in some of the military's newest hardware being obsolete before the end item is initially fielded. While the current attempts at pre-planned product improvement (P^3I) and standardization of components will help to decrease these costs, there is no solution that will ensure these costs can ever be dismissed. In the NAVSUP model, the default value of the obsolescence rate (O) is currently set to an annual rate of 0.10% which is the rate currently used in the inventory EOQ model. Equation 12 illustrates the obsolescence cost calculation.

$$ObsolescenceCosts = (O)(\$Q_T)(HP_O)$$

Equation 12

E. ANALYSIS OF THE MODFL

The NAVSUP Termination model has three advantages primarily. The first of these advantages is the model's ability to be run by an inexpensive personal computer. This advantage provides the item manager with a system that is easier to use than the mainframe computer programs and reduces the workload of the mainframe computer, which already has a constrained capacity. The model will also be easily adapted into the item manager workstation which is currently being designed at ASO.

The second advantage of the model is the options available for computing the various cost factors. This allows for subjective input from the item manager and results in a flexibility for easy data manipulation to account for any rapid changes in the environment.

Finally, the fact that the model is programmed using both a third and fourth generation computer language is an advantage. The third generation language is used only by the model for data retrieval and storage and so the model will be able to easily access numerous other programs also written in COBOL. Since the model interacts with the user through a fourth generation language, the user is able to communicate with the model using a less procedural and more efficient format.

Along with these advantages, the model also has several disadvantages. The first of these is that the model uses the value of the Replenishment Requirement Value for Termination (DEN V083) in the requirements determination applications to initially "flag" a contract for termination. If this value is set too low by the ICP, more contracts will be flagged for review than necessary. This will result in an overabundance of work for both

the item manager and the model. At the present time, the ICP's vary widely in the value they have assigned to this trigger. This researcher believes that ASO's value of $25 is set too low and should be raised significantly to avoid unnecessarily reviewing contracts.

The next disadvantage of the model is that the values the model computes are extremely subjective and may lead to erroneous decisions either as a result of the item manager's inexperience or willful attempt to influence performance measurements. While this aspect of the model is an advantage in that it allows the item manager with flexibility as discussed above, there is no experience for management to use in setting the parameters and determining which Contractor Termination Fee Option to use. Therefore, prudence must be exercised when making these decisions, especially for those elements that can affect several equations such as the time until reorder (T_{RL}) and the holding periods.

Although there are disadvantages to the decision model, this researcher believes the advantages outweigh the disadvantages and that the disadvantages will become less prominent after experience is gained in using the model Most models that are designed to facilitate managers in making correct decisions have some disadvantages and this model is not different. The ICP's will be better off using the model instead of continuing to employ the procedures currently established.

F. SUMMARY

This chapter has provided a background and analysis of the NAVSUP Contract Termination Model. The major components of the model were discussed, followed by

a discussion of the various elements included in the termination costs and the termination cost avoidances. Finally, the advantages and disadvantages of the model were discussed with the conclusion that in the opinion of this researcher, the advantages outweighed the disadvantages. Chapter VI will complete this thesis with the conclusions and recommendations drawn from the study, answers to the research questions, and suggestions for further research.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter will present conclusions to the research effort, answer the research questions posed in Chapter I, provide recommendations to improve the current models, and introduce areas for further research.

B. CONCLUSIONS

1. Conclusion #1: The term "long supply" does not have a universal definition.

The military services and audit agencies use the term "long supply" to refer to situations which arise when assets and requirements do not coincide. These situations include excess material physically on-hand, excess material that is being procured, and excess material for which a purchase order is being processed. The broad and interchangeable use of these terms results in errors when a service or audit agency attempts to report the quantity and dollar value of a service's excess material. Additionally, the ability to include or exclude material under different definitions could lead to confusion and gaming of the system by the services. There will continue to be confusion in this area until a universal definition for the term "long supply" is arrived at by DOD.

2. Conclusion #2: The t~rmination model must be designed to be used by the item manager only.

The initial termination decision model must be designed for the item manager. If the item manager decides the item is actually in excess after using the model, he will then initiate a dialogue with the buyer to terminate one or more procurement actions. As discussed above, the workload of the item manager and his infrequent interaction with the buyer necessitates that the initial termination decision be made solely by the item manager and not by an item manager-buyer dyad.

3. Conclusion #3: The termination decision model must be uncomplicated and expeditious or else the item manager will most likely avoid using it.

The item manager's workload results in his selectively choosing the tasks he will work on based upon the task's perceived importance. For this reason, it is highly unlikely that an item manager will use the decision model as required if the model is cumbersome, requires questioning external sources and waiting for their response, and takes up a considerable amount of the item manager's time. In this case, the model would actually be adding work to the item manager's already constrained scheduled.

4. Conclusion #4: The majority of the decision variables used in the Chapman Termination Model are irrelevant or too complicated to use in a termination decision.

The Chapman Termination Model strays from its basic intent of providing the item manager with a simple, quick decision model whether to terminate a contract for material that is in long supply. The model asks questions pertaining to the requirements determination process which are already made by either the item manager or an

application program. This makes the decision process using the model both time consuming and inefficient.

5. Conclusion #5: The item manager must maintain a good working file.

The application programs used by the item manager are only as good as the information contained in the various UICP databases. If the information contained in these databases is erroneous, the item manager's only chance of correcting the data is through the notes that he has made to the item's hardcopy file that he should be maintaining. If the item manager has failed to make notes on events pertaining to the item, then he has little chance of correcting the data and making an accurate termination decision.

6. Conclusion #6: The data contained in the Due-In/Due-Out File (DDF) must be accurate for a termination decision to be valid.

The information in the DDF must be accurate or else the item manager will err in selecting the appropriate procurement action to terminate. If the DDF does not accurately reflect the status of material that has been received, contracts that have been awarded, and purchase requests that are being processed, the item manager will not be able to make the most cost beneficial action regarding the procurement under consideration. Attention must be paid to the accurate maintenance of this file.

7. Conclusion #7: DOD needs to provide guidance for the collection of termination costs.

The DOD needs to provide guidance to the services on who is responsible for collecting termination costs and percentages of contract completion from contractors. As

discussed in Chapter II, the Navy has attempted to resolve this issue, but was criticized for the manner it chose to do so. Until DOD and the services reach a consensus on how this information is to be obtained, both the services and the contractors will suffer needless administrative and financial burdens.

8. Conclusion #8: A better effort needs to be made to use long supply assets for Foreign Military Sales (FMS) or as Government Furnished Material (GFM) and Government Furnished Equipment (GFE) on current production contracts.

The hardware systems commands and the ICP's need to work more closely in identifying those long supply assets that can be used for FMS or in current production contracts and then make a concerted effort to provide this material to the applicable parties in a timely manner. This will result in the economical use of material rather than holding the material for future use or incurring additional costs from a termination without obtaining the material.

C. ANSWERS TO RESEARCH QUESTIONS

1. Subsidiary question #1: How are items determined to be in excess of requirements by the Navy Aviation Supply Office?

Secondary items are initially identified as being in excess of requirements through one of four methods. These are:

1. Supply Demand Review (B10);
2. Stratification (B20);
3. Item manager initiation; and

4. Special project designation.

Once items have been flagged as excess by one of the above four methods, the item manager may manually compute the item's inventory levels using the Online Requirements Determination Application if he feels that there are changes needed to the data elements. This secondary check allows any data errors or omissions, assuming the item manager knows of them, to be corrected prior to a final decision being made whether material is actually excess. As discussed in Chapter III, this recalculation requirement will indicate whether there should be no termination since there is no excess, a partial termination, a complete termination, or a combination of one or more complete terminations and a partial termination.

2. Subsidiary question #2: How are decisions to terminate the contract for an item in long supply currently made at the Navy Aviation Supply Office?

Until late 1988, ASO initiated few terminations for material in a long supply position. Once terminations were begun to be made, a stringent set of guidelines discussed in Chapter II was to be followed by the item manager to ensure the contract being terminated was not selected prior to considering its impact on support measures and termination costs. This practice was replaced in late 1989 with ASO's decision to terminate all contracts for material in long supply regardless of the type of material or the costs that would be incurred. This latest practice is still employed at ASO today even though NAVSUP has directed the ICP's to establish termination decision models and has also provided the ICP's with a FMSO designed cost-benefit termination model.

3. Subsidiary question #3: What are the key characteristics, in terms of decision variables and parameters, necessary for an accurate and reliable termination decision model?

The key characteristics necessary for an accurate and reliable termination decision model are those variables this researcher defined as applicable in Chapters IV and V of this study. These decision variables provide the user with the ability to quickly and efficiently arrive at an optimal economic decision while evaluating available qualitative and quantitative information concerning the decision. These variables also allow the user to deviate from or change the information provided from the various databases if he has additional information applicable to the decision.

4. Subsidiary question #4: Are there any decision variables or parameters that should be added to or deleted from the Chapman Termination Model?

As discussed in Chapter IV, this researcher believes the majority of the decision variables used in the Chapman Termination Model are irrelevant to the decision process. Inclusion of these decision variables in the model will hinder more than facilitate the decision process. Decision variables that should be added to the process include those contained in the NAVSUP Termination Model and the termination review thresholds established by the ASO OP Policy and Procedure Memo #245 (1989). This memo states that all termination recommendations, regardless of whether the contract is terminated or the procurement is allowed to continue, are subject to review boards. The dollar value of the procurement is the deciding factor for which level of review is needed to approve a termination. Including this variable in the model will provide the item manage with a check to ensure that he does not initiate a termination of a contract whose dollar value

is above his review authority. The values currently used by ASO are listed below in Table IV.

Table IV: Review Thresholds for Terminations

Value of Procurement	Authority
Up to $50,000	Item Manager (GS-5,7, & 9) - For items under his\her cognizance.
Up to $149,999.99	Item Manager (GS-11) - For items under his\her cognizance.
Up to $299,999.99	Section Head\Assistant
Up to $499,999.99	Branch Review Board
Up to $1,999,999.99	Weapons Management Division review Board
Up to $4,999,999.99	OP (Unlimited authority for FMS based on PR and external justification. Also authority to approve all NAVAIR funded PR's.)
$5,000,000.00 and up	Commanding Officer

5. Subsidiary question #5: Is the Naval Supply Systems Command's termination model a feasible alternative to the Chapman Termination Model?

As it is now formulated the Naval Supply Systems Command's termination model is more feasible than the Chapman Termination Model when it is used in conjunction with the Online Requirements Determination Application. If the model is used as a stand alone system, the item manager will not be able to make the best termination decision because the model provides no means of ensuring the accuracy of the excess quantity.

Additionally, while the NAVSUP termination model is more feasible than the Chapman Termination Model, its decision is based on subjective values and quantitative data for which no historical information currently exists.

6. The primary question: **Can the Chapman Termination Model for secondary items in long supply be used in a working environment to accurately determine those items for which a contract should be terminated?**

As currently designed, the Chapman Termination Model cannot be effectively or efficiently used at the Navy Aviation Supply Office. The scope of the decision variables used within the model is too large to be used solely by the item manager or the buyer. The model's dependance on the item manager and buyer's ability to confer with one another on issues as they arise and to obtain and evaluate information from various functional sources within a short period of time is unrealistic. Additionally, many of the decision variables used in the model are either already considered in one of the requirements determination applications or irrelevant to the contract termination decision entirely.

D. RECOMMENDATIONS

1. Recommendation #1: SPCC should make use of the ASO Online Requirements Determination Model.

The Online Requirements Determination Model designed and currently used by ASO provides the item manager with a means of evaluating the asset positions and termination recommendations made by the UICP application programs. This model is not required to be used in every circumstance, but when it is used the item manager can

quickly determine the accuracy of the UICP application's output and input additional information not contained in the UICP database but which might affect the decision. The model also removes some of the subjectivity from the item manager's decision and provides him with a means of justifying his actions. SPCC currently evaluates these decisions by running questionable items through the UICP process a second time. This method is time consuming for the item manager and uses the limited mainframe computer resources needlessly.

2. Recommendation #2: Combine the decision variables highlighted by this researcher's answer to Subsidiary Question #4, the Online Requirements Determination Model and the NAVSUP Termination Model into a single system that can be used by the item manager on a personal computer.

The termination decision model should enable the item manager to evaluate both qualitative and quantitative information. While not primarily designed for termination decisions, the requirements determination portion of the Online Requirements Determination Model provides the item manager with the initial step in the termination decision, which is verifying how many excess items there are if an excess position actually exists.

The NAVSUP Termination Model then completes the second step of the decision process by enabling the item manager to determine the optimal economic quantity of items to terminate. By combining these two models into a single system, the item manager would have all the tools necessary to make the best decision. Additionally,

combining the two models into a single system that can be used on a personal computer would allow the item manager to make a more efficient and effective decision.

E. SUGGESTIONS FOR FURTHER RESEARCH

1. Further research should be conducted on designing an expert system for contract termination decisions that integrates the decision variables discussed by this researcher in the answer to Subsidiary Question #4, the ASO Online Requirements Determination Model, and the NAVSUP Contract Termination Model. The use of a natural language in an expert system and the system's ability to infer new information based on existing information would provide the item manager with a tool that provides consistent performance and preserves knowledge from past experiences.

2. Further research should be conducted to determine the feasibility of incorporating an access capability to the database from the Defense Logistics Agency's Mecnanization of Contract Administration Services System (MOCAS) into the contract termination decision model. This would provide the item manager with real time information regarding the production and delivery status of awarded contracts.

3. Further research should be conducted to gather historical data on the costs associated with contract terminations based on the percentage of contract completion to determine realistic measurements for use in a termination decision model.

4. Further research should be conducted to determine more effective ways of procuring material that has independent demand and potentially long production leadtimes. The use of Indefinite Delivery Type Contracts (IDTC's) and Just-In-Time (JIT) inventory

techniques by the inventory control points could result in a reduction in the amount of material or the frequency with which material goes into a long supply status. The applicability of using these two, and other, techniques should be evaluated.

APPENDIX A

GLOSSARY

Administrative Leadtime (ALT). The length of time from the generation of a procurement action until a contract is awarded. (NAVSUP PUB 553, 1987, p. A-I)

Cyclic Levels and Forecasting. An application program contained within the Navy's UICP and designed to calculate the reorder level, economic order quantity, and safety level for each item to allow a buy requirement to be made. (NAVSUP PUB 553, 1987, p. 3-27)

Diminishing Manufacturing Sources and Material Shortages (DMSMS). The loss or impending loss of manufacturers of items or supplies of items or raw material. DMSMS is caused when manufacturers of items or raw material suppliers discontinue production. Some of the reasons are as follows:
a. Rapid change in item or material technology;
b. Uneconomical production requirements;
c. Foreign source competition;
d. Federal environmental and safety requirements; or
e. Limited availability of items and raw material used in the manufacturing process.

DMSMS situations tend to have a pervasive effect that not only precludes repair of material but also precludes procurement of additional systems, equipment, spare assemblies, and subassemblies that depend on the DMSMS items and raw material for their manufacture. DODI 4005.16, 1984, Encl. II, p. 2-1)

Due-In Contract Initiated (DICI). That quantity of material which exceeds the retention limit and has one or more purchase requests initiated by a buying activity for its procurement. (NAVSUP PUB 553, 1988, p. 4-36)

Due-In Long Supply (DILS). That quantity of material which exceeds the retention limit and has one or more contracts awarded for its procurement. (NAVSUP PUB 553, 1988, p. 4-36)

Excess. That quantity of material which exceeds the authorized retention limit and is currently on-hand at some location. (NAVSUP PUB 553, 1988, p. 4-36)

Implied Shortage Cost. The assumed cost of a shortage based upon other management decisions relative to the number of days to be forecast for delay in the availability of material or the funds available for inventory levels. DODI 4140.39, 1970, Encl. I, p. 1)

Life-of-type (LOT) buy. A one-time procurement, when all cost-effective and prudent alternatives have been exhausted, for the total future requirement of an item no longer to be produced. The procurement quantity shall be based upon demand or engineering estimates of mortality sufficient to support the applicable equipment until phased out. (DODI 4005.16, Encl. II, p. 2-2)

Obsolescence. The process by which an item becomes no longer technically useful. (NAVSUP PUB 553, 1987, p. A-13)

Online Requirements Determination Model (Recalc). An ASO developed application program designed to be run on a personal computer by the item manager to allow the item manager to review SDR and Stratification recommendations using current data.

Planned Program Requirements (PPRs). An anticipated requirement for material that cannot be adequately forecasted by UICP using past demand observations. These future requirements are known sufficiently ahead of the need for the material that assets can be obtained to meet the demand. Theoretically, PPRs for scheduled projects or programs are requested as nonrecurring demand by the customers. (NAVSUP PUB 553, 1987, p. A-14)

Principal Items. End items and replacement assemblies whose importance requires centralized individual item management throughout the supply system. These specifically include the items for which there is a need for central inventory control, including: computation of requirements, procurement, direction of distribution, and knowledge and control of all assets owned by the DOD Component. (DODI 4100.37, p. 3)

Procurement Lead Time (PCLT). The length of time from the initiation of a procurement action until the initial receipt of material from contract. The sum of PLT + ALT. (NAVSUP PUB 553, 1987, p. A-14)

Production Lead Time (PLT). The length of time from procurement contract award until the initial receipt of material from contract. (NAVSUP PUB 553, 1987, p. A-15)

Retention Limit. The maximum quantity of an item that is authorized to be retained within the wholesale supply system to meet future requirements. (NAVSUP PUB 553, 1987, p. A-17)

Safety Level. The quantity of material which is required to be on hand to permit continued operation in the event of minor interruption of normal replenishment or unpredictable fluctuation in demand. (DODI 4100.39, 1970, p. 6)

Secondary Items. End items, consumables, and repairable items other than principal items. (DODI 4100.39, 1970, p. 3)

Stratification. An application program contained within the Navy's UICP and designed to project inventory requirements This program serves as 1) the means of computing various requirements levels and arranging them in priority, 2) the basis for budget preparation, and 3) a way to identify items for potential disposal. (NAVSUP 553, 1987, p. 3-36)

Supply Demand Review. An application program contained within the Navy's UICP and designed to determine whether assets balance requirements on an item by item basis. The program will recommend 1) a procurement, 2) a disposal recall, or 3) a contract termination. (NAVSUP PUB 553, 1970, p. 3-30)

Total Variable Cost (TVC). The sum of the variable cost to order, variable cost to hold and implied shortage cost. Procurement cycles and safety levels are determined through minimization of these costs for any given group of items in an inventory. (DODI 4140.39, 1970, Encl. I, pp. 1-2)

Uniform Inventory Control Program (UICP). A series of computer files and programs used by Navy Inventory Control Points (ICPs) to manage wholesale supply system inventories. (NAVSUP PUB 553, 1987, p. A-20)

Variable Cost to Hold. Those costs associated with the cost of capital, inventory losses, obsolescence, storage, and other variable costs of maintaining an inventory. Costs are considered "fixed" if they would remain constant should 50-of the workload be eliminated. (DODI 4140.39, 1970, Encl. I, p. 1)

Variable Cost to Order. Those costs associated with the determination of requirements, processing of a purchase request, and subsequent contract actions through receipt of the order into the ICP system that will vary significantly in relation to the number of orders processed. Costs are considered "fixed" if they would remain constant should 50% of the workload be eliminated. (DODI 4140.39, 1970, Encl. I, p. 1)

APPENDIX B

CHAPMAN TERMINATION MODEL DECISION STEPS

NOTE 1: The figure numbers listed below the diagrams refer to the original figures used by Chapman.

NOTE 2: Throughout the following steps it is important to realize that when the phrase "go to step 15" appears, the quantity in question is to be terminated. Starting with step 15, the only question is what method of termination is appropriate.

Step 1

Item is identified as being in excess. There are three ways in which this can be determined:

1. SDR--Based on Net Asset Position being positive:

Assets	Requirements
OH (On-hand)	Reorder level (Lead Time Demand + Safety Level)
Due on Purchase Request	AWR (Acquisition War Reserves)
Due on Contract	Backorders
Other Due	Due Out
	Planned Program Requirements (PPRs) within PCLT
Total Assets	Total Requirements

2. Stratification--Based upon determination of the retention limit. This is based upon a summation of the following categories:

Reorder level (LTD + SL)
Backorders
PPR's
Mobilization Requirements
Recurring demand forecasts through budget year
Order quantity
Economic retention quantity
Contingency retention objective
Approved acquisition objective
Approved force retention quantity

If assets (on-hand and due-in) exceed this retention limit, they are potential excess quantities.

3. Manual--information is received by the IM that would drastically change an item's status. Examples might be equipment overhauls, weapon system termination,

program stretchout, item migration to other branches of the services or DLA, major operational tempo decrease due to funding constraints, or even being obsolete due to new technology.

Ensure files (both the Master Data File, MDF, and the Due-in/Due-out File) are updated as necessary before proceeding further. The IM must input her knowledge of the item which is not reflected in these files to ensure an accurate "picture" of the item's status is obtained. Potential inputs include: placing the material in the correct material condition code, looking at past CSSR's to see if PPR's were accidentally "browsed" out, and checking to ensure all planned outfittings are included. If the item is still in an excess position after the files have been updated, go to step 2.

<u>Step 2</u>

Are there any outstanding procurement actions (either purchase requests or contracts for the remainder of this model)?

-- if no, STOP, as there are no outstanding contracts.

-- If yes, go to step 3.

<u>Step 3</u>

Compute the dollar value of the excess material: Quantity in excess x replacement price. Then go to step 4.

<u>Step 4</u>

Is the excess the result of a Life-of-Type (LOT) buy? LOT buy is a one time procurement of sufficient quantity to meet all demands through the items useful life The preferred situation for LOT buys would be that a "flag" would be turned on for the item in the Master Data File (MDF) so that SDR would not do an excess computation on the

item. But, unless this flag is applied 100% of the time, and only to the correct items, this added step in logic might prevent accidentally terminating a LOT buy.

-- if no, go to step 4a.

-- if yes, STOP, continue procurement actions.

Step 4a

Are applicable weapon systems in use by the U.S. military services (active or reserve) or by foreign governments?

-- if no, go to step 15.

-- if yes, go to step 5.

Step 5

Is the item itself obsolete? The definition of obsolete used in this model is similar to that of functional obsolescence in Black's Law Dictionary

> obsolete--the state in which an item needs replacement because its parent structure or equipment has become inefficient or outmoded because of improvements developed since its original construction or production. An item can be obsolete to the Active Navy, Reserve Navy, and/or foreign governments having this weapon system.

-- if no, go to step 6.

-- if yes, go to step 100.

Step 6

Was the procurement action under examination for potential termination based upon a defective, faulty or imperfect specification rendering the item unusable for its original purpose? The IM will obtain this information by one or both of the following methods. First, either the end user (in the case of filling backorders) or the receiving personnel at

a stock point (in normal situations) might detect and report a problem with the items form, fit, or function. The second method is that of communications received from the technical pers nne! at either the ICP, the appropriate Systems Headquarters, or even from the contractor himself concerning problems or potential problems with the specification.

-- if no, go to step 7.

-- if yes, go to step 15.

Step 7

Has there been a change since the last SDR in the applicable engineering support metho... : t · used for this item? (From repairable to consumable, from field level repair to depot repair, etc.)

-- if no, go to step 8.

-- if yes, go to step 12.

Step 8

Has there been a change in funded PPRs since the last SDR?

-- if no, go to step 9.

-- if yes, go to step 20.

Step 9

Was this item procured under a SAIP (Spares Acquisition Integrated with Production) program?

-- if no, go to step 10.

-- if yes, go to step 20.

Step 10

Is the dollar value of the excess > $2,000? This value is used due to FAR 49.101(c) which recommends that contracts less than $2,000 should normally not be terminated.

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 50.

Step 12

Will the applicable Hardware Systems Command buy the item from the Navy Stock Fund?

-- if no, go to step 15.

-- if yes, STOP. Continue procurement action.

Step 15

Cancel all purchase requests, then go to step 16.

Step 16

Any open contracts?

-- if no, STOP.

-- if yes, go to step 17.

Step 17

Is a no cost settlement acceptable to the applicable contractor?

-- if no, go to step 18.

-- if yes, issue no cost settlement, then STOP.

Step 18

Can the contract be terminated for default?

-- if no, issue termination for convenience, then STOP.

-- if yes, issue termination for default, then STOP.

Step 20

Was the weapon system the item was used in deleted, retired or otherwise removed from the Navy's and other services' inventories?

-- if no, go to step 25.

-- if yes, go to step 21.

Step 21

Are there any other weapon system applications for this item?

-- if no, go to step 15.

-- if yes, go to step 28.

Step 25

Did the item's program suffer a major delay?

-- if no, go to step 30.

-- if yes, go to step 26.

Step 26

Was the program slippage longer than the items PCLT?

-- if no, go to step 28.

-- if yes, go to step 27.

Step 27

Are proposed contractor termination fees greater than 50% of contract value?

-- if no, go to step 15.

-- if yes, go to step 28.

Step 28

Is the item's IMEC (Item Mission Essentiality Code) 3 or 4?

-- if no, go to step 32.

-- if yes, go to step 200.

Step 30

Was the item's applicable program reduced?

-- if no, go to step 28.

-- if yes, go to step 31.

Step 31

Are items in excess of the new total requirement plus expected demand during PCLT?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 28.

Step 32

Is the dollar value of the excess > $2,000?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 55.

Step 50

Is the item's IMEC 3 or 4?

-- if no, go to step 55.

-- if yes, go to step 200.

Step 55

Is the item's demand trending upward?

-- if no, go to step 56.

-- if yes, go to step 250.

<u>Step 56</u>

Is the dollar value of the excess being procured > $2,000?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 57.

<u>Step 57</u>

Are there any outstanding purchase requests?

-- if no, go to step 60.

-- if yes, go to step 58.

<u>Step 58</u>

Terminate purchase requests until:

-- no excess remains, STOP.

-- all purchase requests terminated, go to step 60.

<u>Step 60</u>

Is the dollar value of the excess ≤ $10,000?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 61.

<u>Step 61</u>

Initiate partial or complete terminations of contracts until all excess is eliminated or until all contracts have been terminated. Then STOP.

Step 100

Is there a commercial alternative which would fulfill form, fit and function of obsolete item?

-- if no, go to step 301.

-- if yes, go to step 101.

Step 101

Compute new requirements using the commercial alternative's PCLT. Compare the on-order quantity to the new requirement.

-- on-order > new requirement, go to step 15. Note: if new requirements are greater than zero, the IM must order new items.

-- on-order less than or equal to new requirement, STOP. Note: it is highly unlikely that an item will end up here. This is because SDR "said" item was in a long supply status, yet now the on-order quantity is less than the new requirement. The IM needs to find out why this is so. The three choices for action to be taken, depending upon that the IM determines, are: (1) terminate the contract, (2) consolidate stock to a minimum number of stock points, and (3) leave the order as is.

Step 200

Is the item's demand trending upward?

-- if no, go to step 201.

-- if yes, go to step 250.

Step 201

Is the item's demand trending downward?

-- if no, go to step 210.

-- if yes, go to step 202.

Step 202

Terminate purchase requests until:

-- no excess remains, STOP.

-- all purchase requests are terminated, go to step 203.

Step 203

Is the item's unit price > $2,000?

-- if no, go to step 204.

-- if yes, go to step 205.

Step 204

Terminate all contracts except for one item from the contract with earliest required delivery date (RDD), favor small business over large business for continuing, then STOP.

Step 205

Partially or completely terminate contracts until the excess is < $2,000. Favor small over large business. Cancel contracts with farthest PDD's first.

Step 210

Can the item be used as Government Furnished Material on parent equipment contracts presently outstanding or nearing award?

-- if no, go to step 211.

-- if yes, go to step 225

Step 211

Is the dollar value of the excess ≤ $10,000?

-- if no, go to step 212.

-- if yes, STOP. Continue procurement actions

Step 212

Are any purchase requests for the item outstanding?

-- if no, go to step 214.

-- if yes, go to step 213.

Step 213

Terminate purchase requests until:

-- no excess remains, STOP.

-- all purchase requests terminated, go to step 214.

Step 214

Is the dollar value of the remaining excess ≤ $50,000?

-- if no, go to step 215.

-- if yes, STOP. Continue remaining procurement actions.

Step 215

Partially or completely terminate contracts until all excess is eliminated or until all contracts have been terminated, then STOP. Favor small over large business. Cancel contracts with farthest RDD's first.

Step 225

Issue modification to present equipment contract(s) to reflect item being provided as Government Furnished Material vice Contractor Furnished Material, then:

-- no excess remains, STOP. Continue procurement actions.

-- all excess items remaining, go to step 211.

Step 250

Does the item have a shelf life or is it hazardous material?

-- if no, go to step 260.

-- if yes, go to step 251.

Step 251

Is the item hazardous material?

-- if no, go to step 252.

-- if yes, go to step 326.

Step 252

Check with technical personnel and/or review the last CSSR received to ascertain probable cause for change in demand:

-- if aberration, go to step 253.

-- if not an aberration, go to step 254.

Step 253

Align computed requirements to RDD's of outstanding procurement actions, then go to step 360.

Step 254

Update the Quarterly Systems Demand Forecast (UICP application B074) to reflect the new demand and PPR's requiring adjustments. Data elements requiring updates might include new lead time values, known upcoming ship deployments, change in IMEC, or change in unit price. Then go to step 255.

Step 255

Recompute assets to requirements. Is the item still in a long supply situation?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 256.

Step 256

Align newly computed requirements to RDD's of outstanding procurement actions, then go to step 257.

Step 257

Identify items to requirement, by date. Partially or completely cancel purchase requests or terminate contracts until no excess remains, then STOP.

Step 260

Check with technical personnel and/or review the last CSSR received to ascertain probable cause for change in demand.

-- if aberration, go to step 56.

-- if not an aberration, go to step 261.

Step 261

Update the Quarterly Systems Demand Forecast (UICP application B074) to reflect the new demand and PPR's requiring adjustments. Data elements requiring updates might

include new lead time values, known upcoming ship deployments, change in IMEC, or change in unit price. Then go to step 262.

Step 262

Recompute assets to requirements. Is the item still in a long supply status?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 56.

Step 301

Does the item have a shelf life or is it hazardous material?

-- if no, go to step 305.

-- if yes, go to step 302.

Step 302

Is the item hazardous material?

-- if no, go to step 303.

-- if yes, go to step 325.

Step 303

Is the item's IMEC 3 or 4?

-- if no, go to step 350.

-- if yes, go to step 300.

Step 305

Is the dollar value of the excess > $2,000?

-- if no, STOP. Continue procurement actions.

-- if yes, go to step 306.

Step 306

Is the item's IMEC 3 or 4?

-- if no, go to step 307.

-- if yes, go to step 200.

Step 307

Terminate purchase requests until excess is gone or until all purchase requests are terminated. No excess?

-- if no, go to step 308.

-- if yes, STOP.

Step 308

Is the unit price > $2,000?

-- if no, go to step 309.

-- if yes, go to step 310.

Step 309

Terminate contracts with RDD's farthest from present date until excess is less than $2,000, then STOP.

Step 310

Terminate all contracts with the exception of 1 unit or unit pack. The item saved should be from the contract with the closest, firm RDD. Then STOP.

Step 325

Is the item's IMEC 3 or 4?

-- if no, go to step 340.

-- if yes, go to step 326.

Step 326

Can the average customer wait time standard be met by one stock point on each coast?

-- if no, go to step 335.

-- if yes, go to step 327.

Step 327

Are existing hazardous material storage areas available in adequate size for stocking at a single stock point on each coast?

-- if no, go to step 335.

-- if yes, go to step 328.

Step 328

Consolidate inventory at one activity per coast to maximize bin closings at NSC's. Then go to step 329.

Step 329

Is the dollar value of the excess < $10,000?

-- if no, go to step 331.

-- if yes, go to step 330.

Step 330

STOP. Continue all procurement actions. Modify contracts and purchase requests to reflect new delivery points.

Step 331

Are there any purchase requests outstanding?

-- if no, go to step 333.

-- if yes, go to step 332.

Step 332

Terminate purchase requests until the excess is gone or until all purchase requests are terminated. Any excess?

-- if no, STOP.

-- if yes, go to step 333.

Step 333

Is the dollar value of the excess ≤ $50,000?

-- if no, go to step 215.

-- if yes, go to step 330.

Step 335

Do all stock points have adequate and proper storage facilities for the quantity in procurement which will be stored there?

-- if no, go to step 336.

-- if yes, go to step 211.

Step 336

Cancel the quantity in excess of proper storage capacity for each stock point. Cancel purchase requests first, then contracts most recently awarded until proper storage capacity constraints are met. Then STOP. Continue the procurement actions not canceled or terminated.

Step 340

Is dollar value of excess > $2,000?

-- if no, go to step 341.

-- if yes, go to step 342.

Step 341

Are adequate and proper storage facilities available at all stock points?

-- if no, go to step 336.

-- if yes, STOP. Continue procurement actions.

Step 342

Cancel purchase requests until excess is gone or until all purchase requests canceled. Any excess?

-- if no, STOP.

-- if yes, go to step 16.

Step 350

Compare the item's shelf life with RDD's of outstanding procurement actions.

-- if foreign government requirements only, go to step 351.

-- all others, go to step 355.

Step 351

Compute the estimated cost of disposal and holding the item. Go to step 352.

Step 352

Compute the estimated proceeds of future sales to foreign governments. Go to step 353.

Step 353

Compare the costs of disposal and holding to the proceeds of sale.

-- if result positive, go to step 15.

-- if result negative, STOP. Continue procurement actions.

Step 355

Align computed requirements to ADD's of outstanding procurement actions, then go to step 360.

Step 360

Cancel purchase requests for items which, when compared to RDDs, are anticipated to exceed their shelf life prior to projected requirements, then go to step 361.

Step 361

Is the dollar value of the excess > $2,000?

-- if no, STOP. Continue remaining procurement actions.

-- if yes, go to step 362.

Step 362

Protect the minimum of: demand during shelf life, or lead time (PCLT) demand. Any excess?

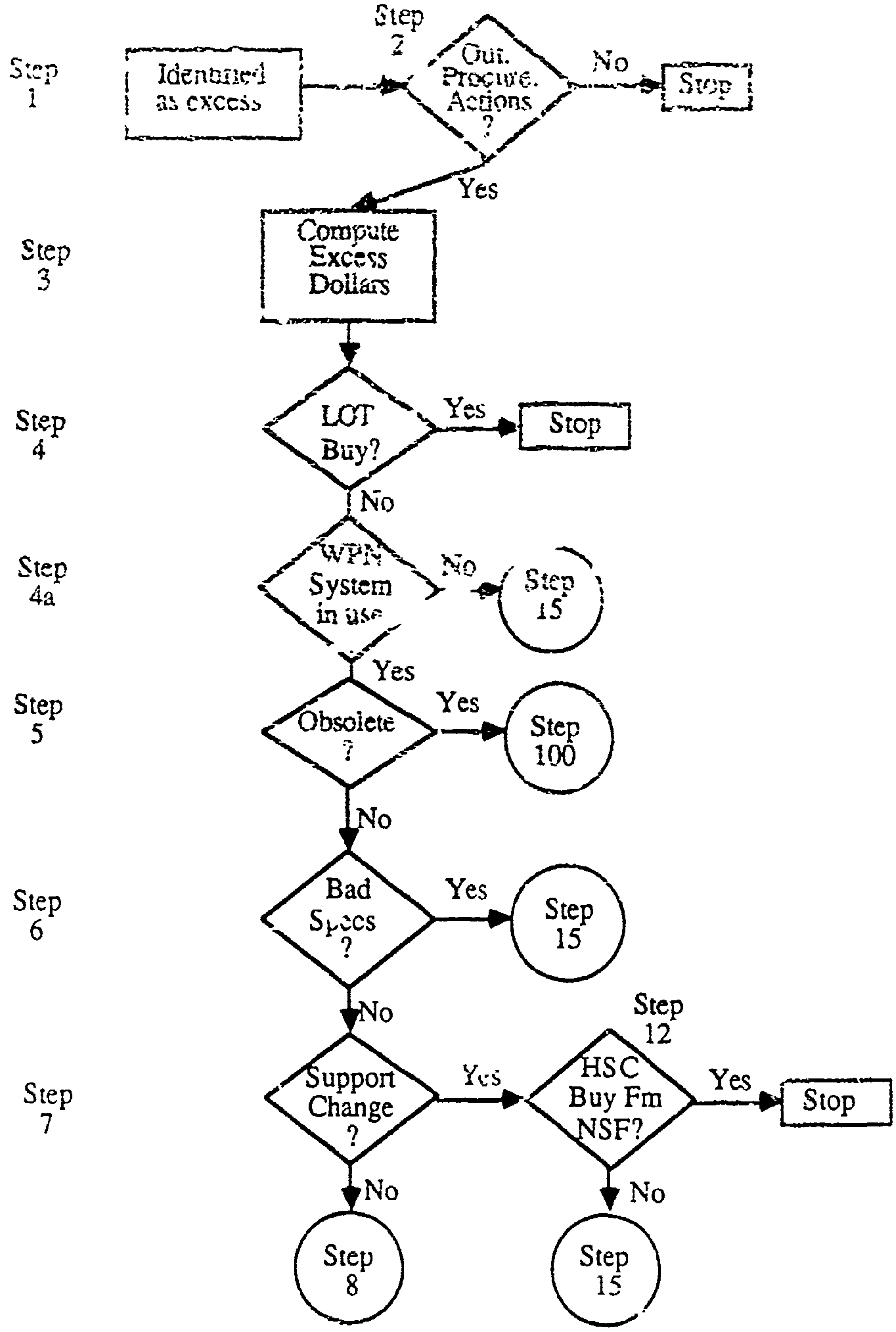
-- if no, STOP.

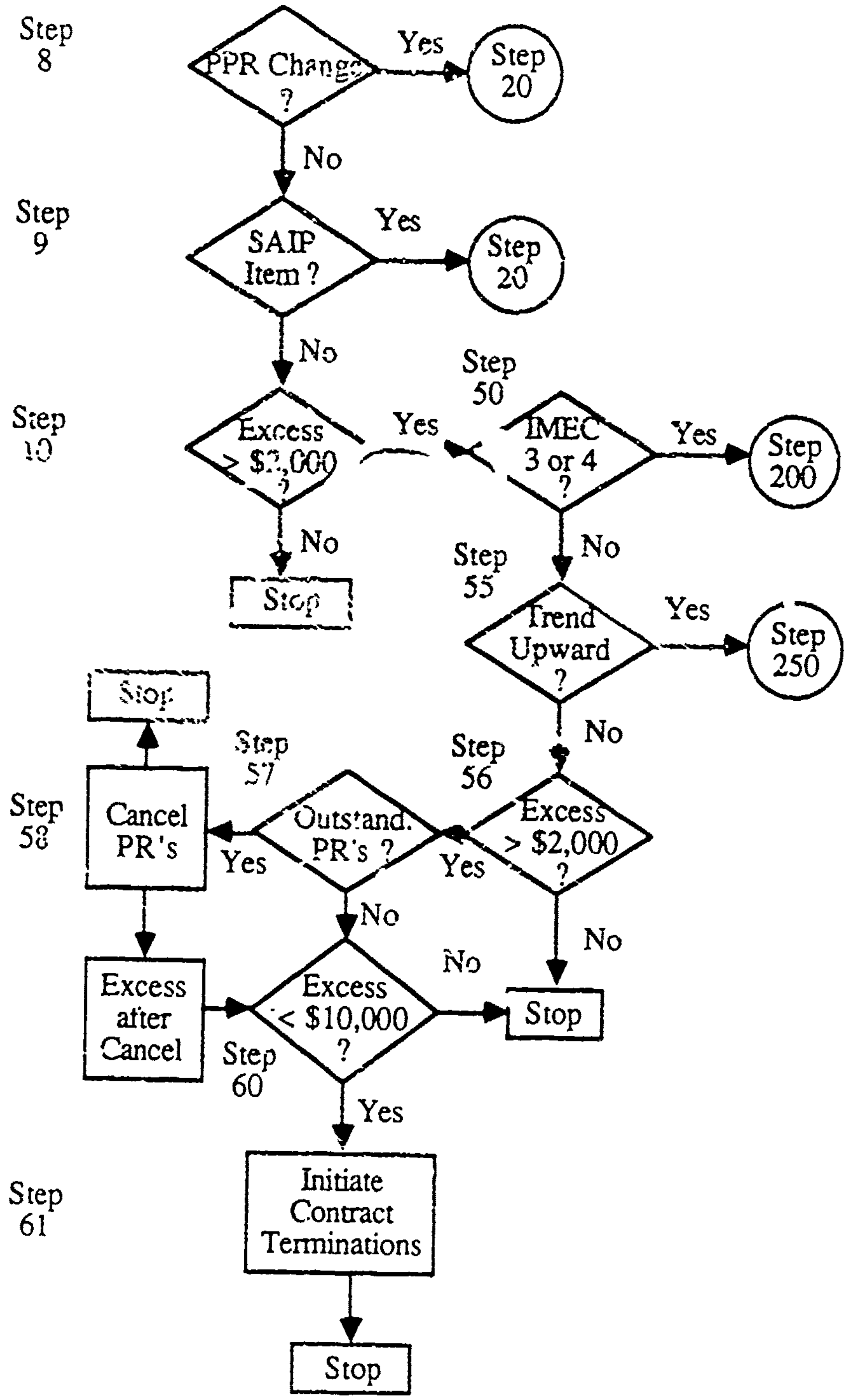
-- if yes, go to step 15.

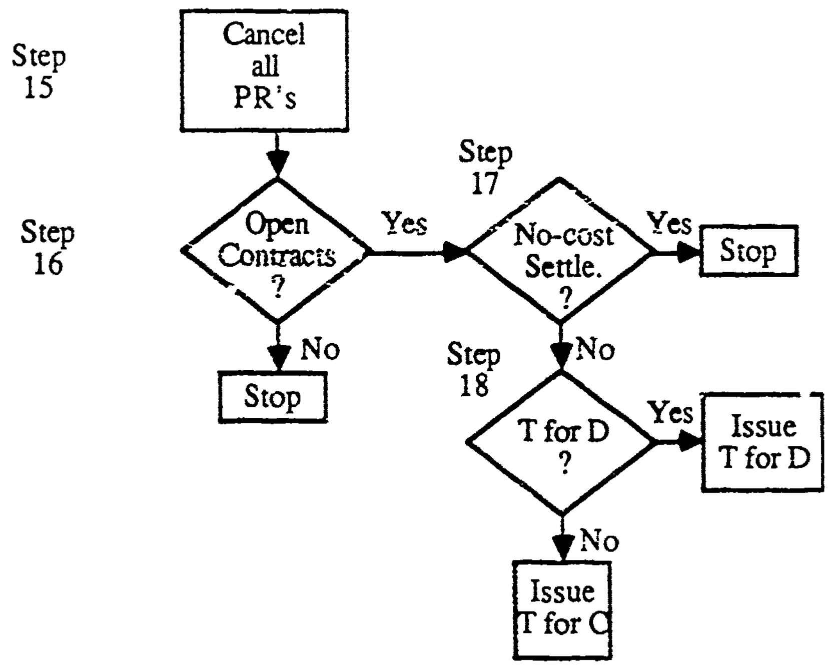
Appendix C is the actual flow chart which graphically illustrates how the model functions. The wording in the flow chart itself is very limited, thus if the reader has questions, referring back to the above listed steps should provide the proper answers.

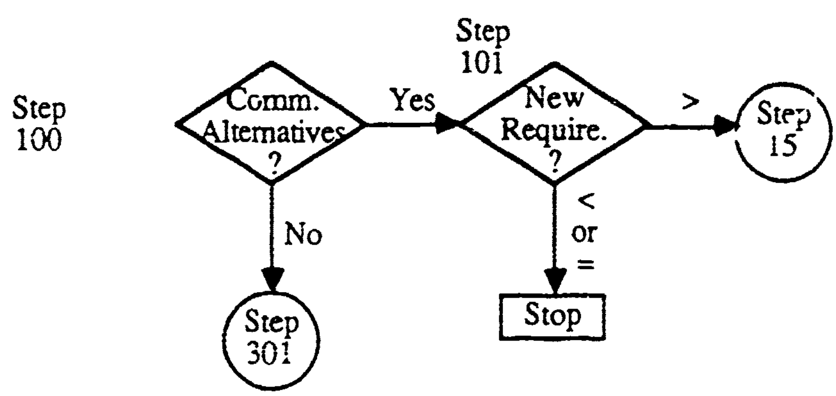
APPENDIX C

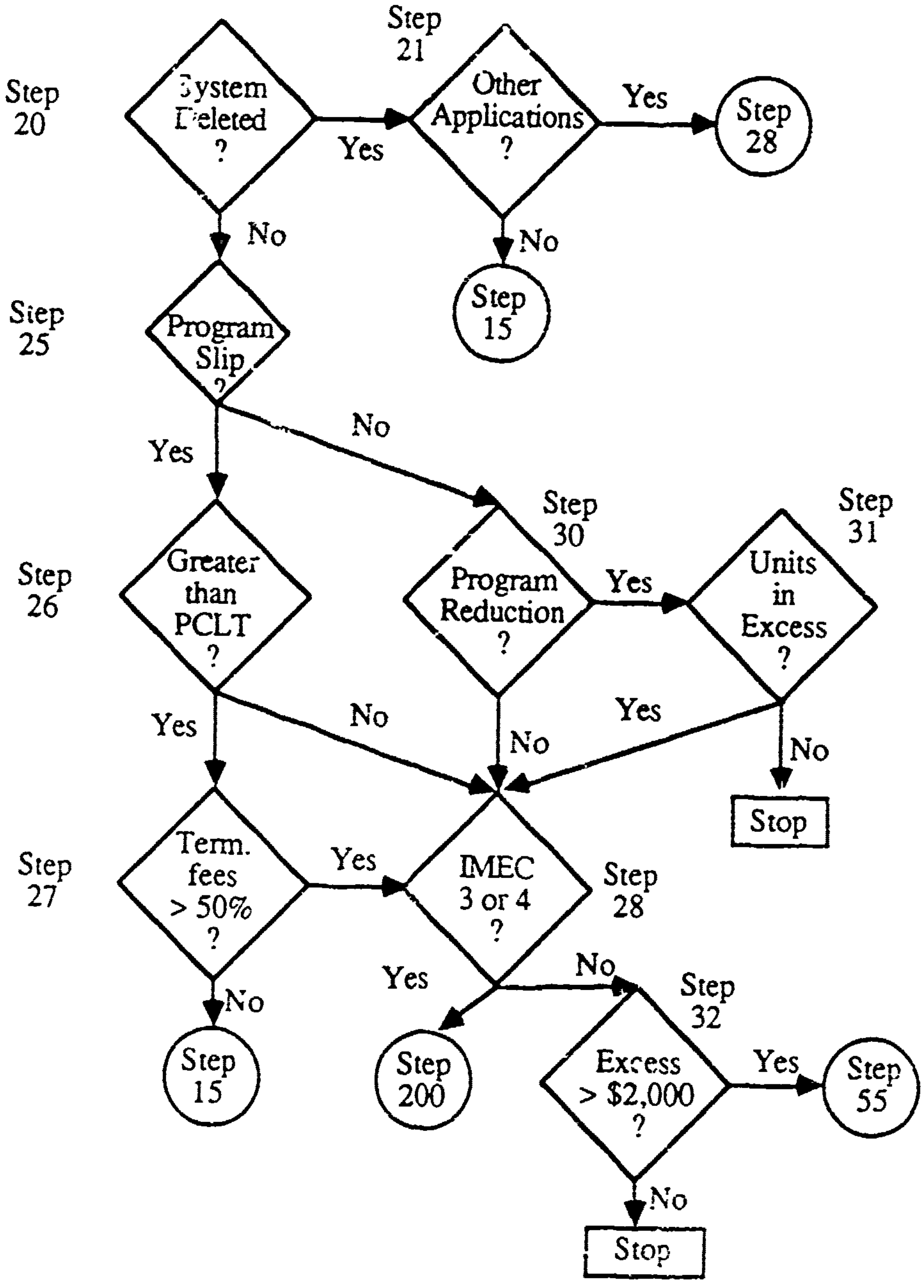
LOGIC FLOW DIAGRAMS

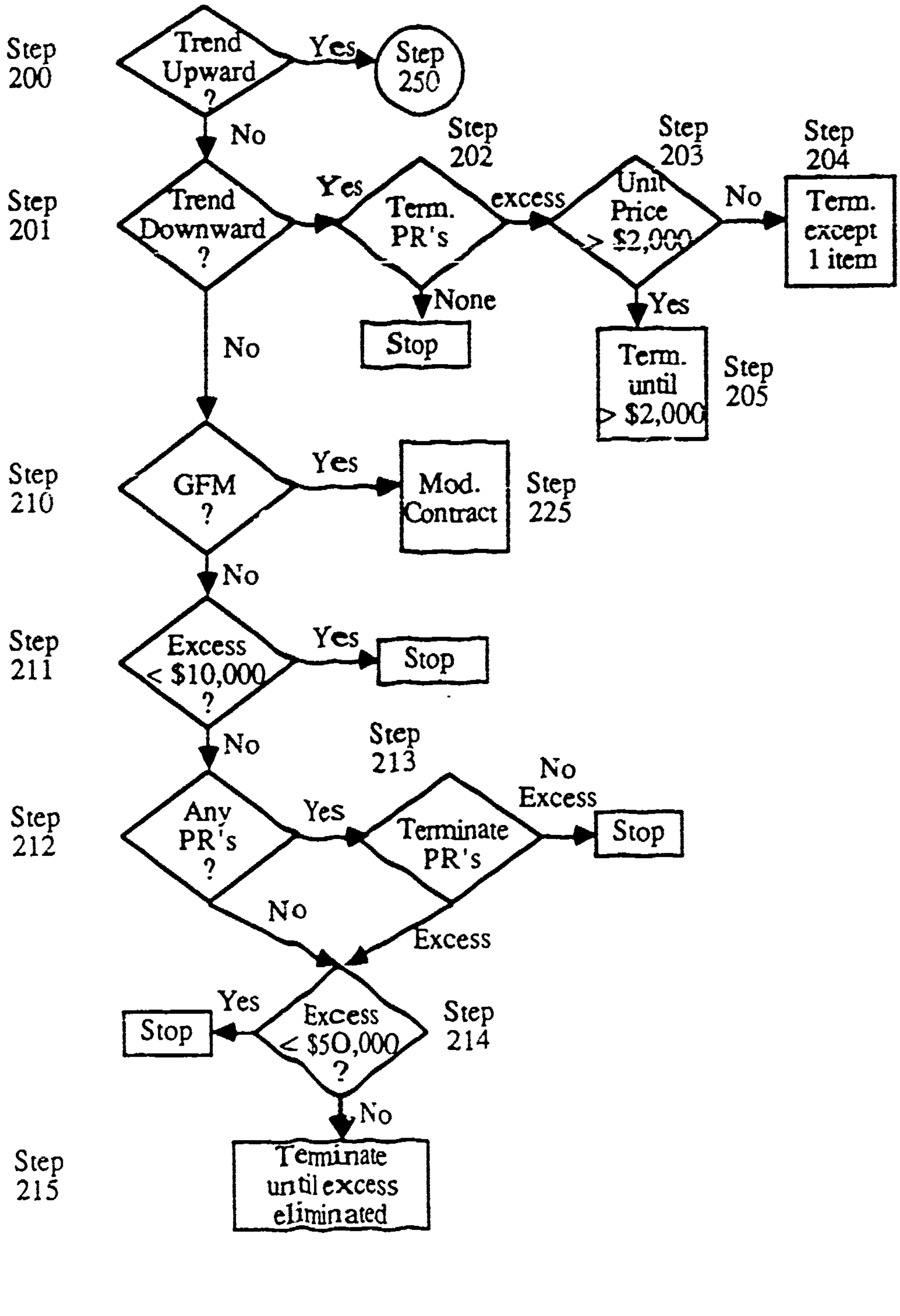

Step 1
Identified as excess
Step 2
Out. Procure. Actions ?
No
Stop
Yes
Step 3
Compute Excess Dollars
Step 4
LOT Buy?
Yes
Stop
No
Step 4a
WPN System in use
No
Step 15
Yes
Step 5
Obsolete ?
Yes
Step 100
No
Step 6
Bad Specs ?
Yes
Step 15
No
Step 7
Support Change ?
Yes
Step 12
HSC Buy Fm NSF?
Yes
Stop
No
Step 8
No
Step 15

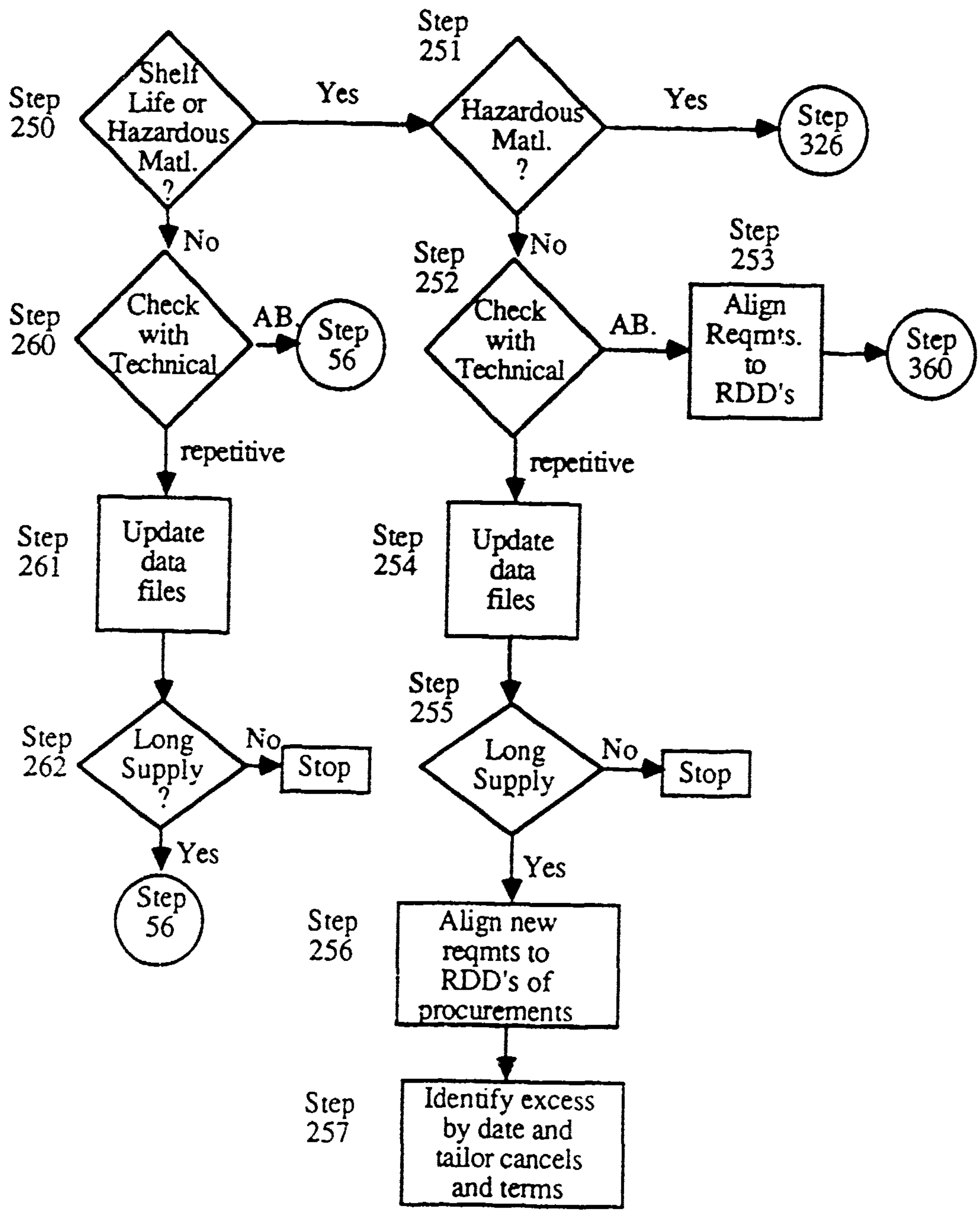

Step 8
PPR Change ?
Yes
Step 20
No
Step 9
SAIP Item ?
Yes
Step 20
No
Step 10
Excess > $2,000 ?
Yes
No
Stop
Step 50
IMEC 3 or 4 ?
Yes
Step 200
No
Step 55
Trend Upward ?
Yes
Step 250
No
Step 56
Excess > $2,000 ?
Yes
No
Stop
Step 57
Outstand. PR's ?
Yes
No
Step 58
Cancel PR's
Stop
Excess after Cancel
Step 60
Excess < $10,000 ?
No
Yes
Step 61
Initiate Contract Terminations
Stop

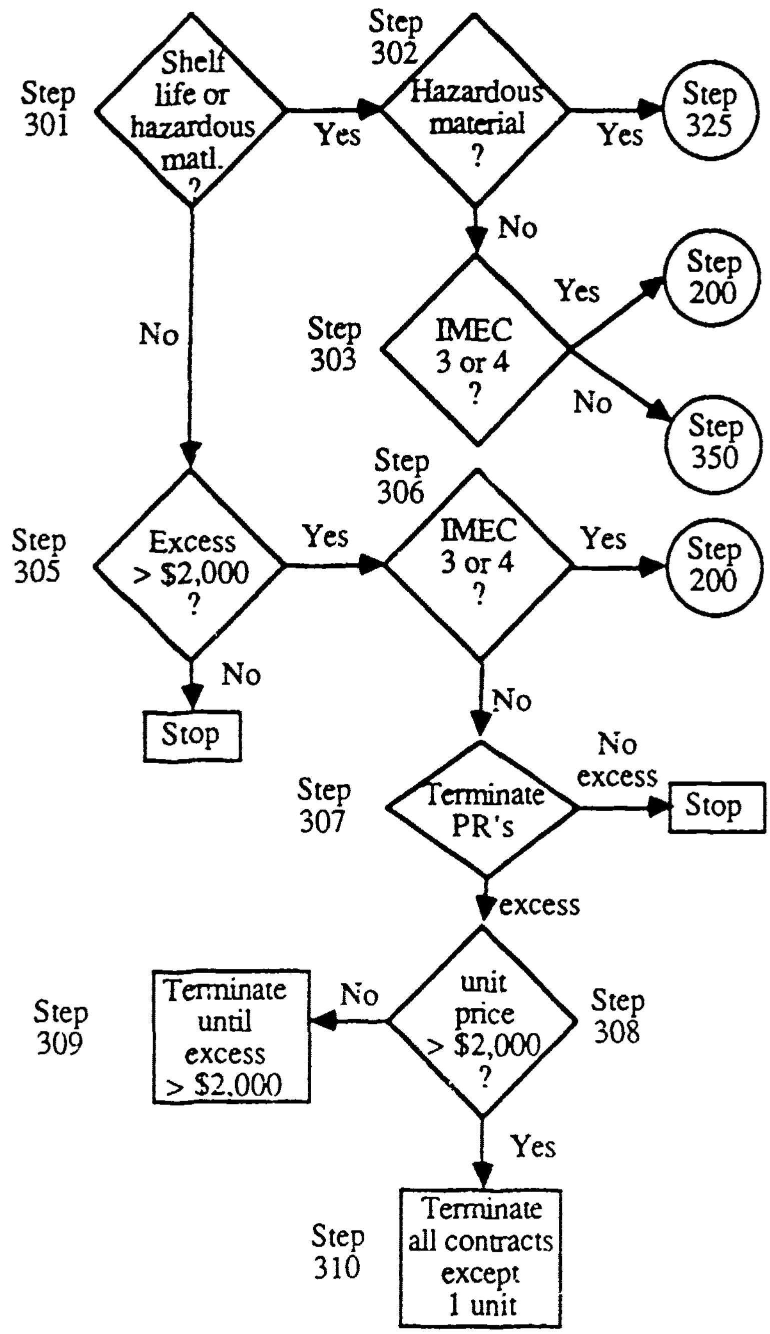

Step 15
Cancel all PR's
Step 16
Open Contracts ?
Yes
No
Stop
Step 17
No-cost Settle. ?
Yes
Stop
No
Step 18
T for D ?
Yes
Issue T for D
No
Issue T for C

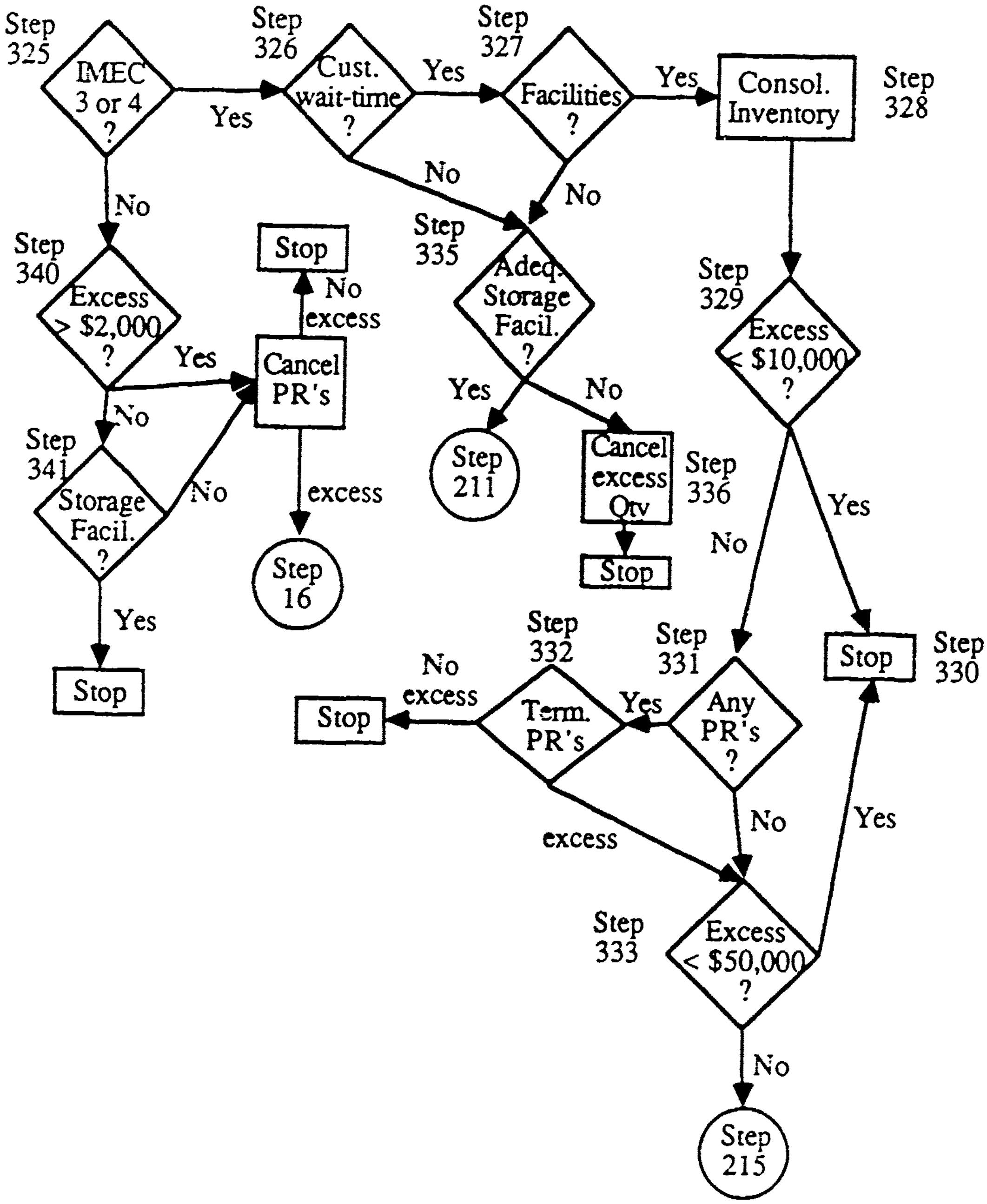

Step 100
Comm. Alternatives ?
Yes
No
Step 301
Step 101
New Require. ?
>
Step 15
< or =
Stop


Step 20
System Deleted ?
Yes
No
Step 21
Other Applications ?
Yes
Step 28
No
Step 15
Step 25
Program Slip ?
Yes
No
Step 26
Greater than PCLT ?
Yes
No
Step 30
Program Reduction ?
Yes
No
Step 31
Units in Excess ?
Yes
No
Stop
Step 27
Term. fees > 50% ?
Yes
No
Step 15
IMEC 3 or 4 ?
Step 28
Yes
No
Step 200
Step 32
Excess > $2,000 ?
Yes
Step 55
No
Stop

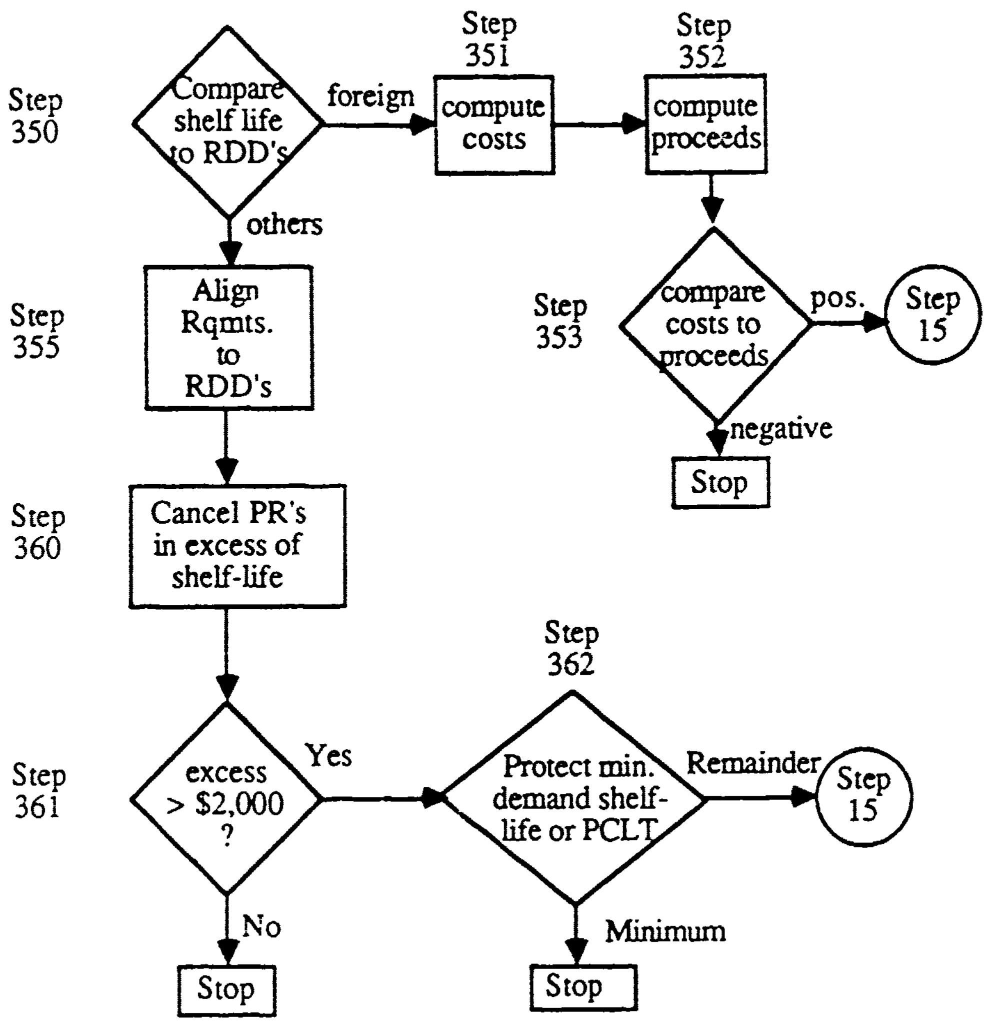

Step 200
Trend Upward ?
Yes
Step 250
No
Step 201
Trend Downward ?
Yes
Step 202
Term. PR's
None
Stop
excess
Step 203
Unit Price > $2,000
No
Step 204
Term. except 1 item
Yes
Term. until > $2,000
Step 205
No
Step 210
GFM ?
Yes
Mod. Contract
Step 225
No
Step 211
Excess < $10,000 ?
Yes
Stop
No
Step 212
Any PR's ?
Yes
Step 213
Terminate PR's
No Excess
Stop
No
Excess
Yes
Stop
Excess < $50,000 ?
Step 214
No
Step 215
Terminate until excess eliminated


Step 250
Shelf Life or Hazardous Matl. ?
Yes
Step 251
Hazardous Matl. ?
Yes
Step 326
No
Step 260
Check with Technical
AB.
Step 56
repetitive
Step 261
Update data files
Step 262
Long Supply ?
No
Stop
Yes
Step 56
No
Step 252
Check with Technical
AB.
Step 253
Align Reqmts. to RDD's
Step 360
repetitive
Step 254
Update data files
Step 255
Long Supply
No
Stop
Yes
Step 256
Align new reqmts to RDD's of procurements
Step 257
Identify excess by date and tailor cancels and terms


Step 301
Shelf life or hazardous matl. ?
Yes
Step 302
Hazardous material ?
Yes
Step 325
No
Step 303
IMEC 3 or 4 ?
Yes
Step 200
No
Step 350
No
Step 305
Excess > $2,000 ?
Yes
Step 306
IMEC 3 or 4 ?
Yes
Step 200
No
Stop
No
Step 307
Terminate PR's
No excess
Stop
excess
Step 308
unit price > $2,000 ?
No
Step 309
Terminate until excess > $2,000
Yes
Step 310
Terminate all contracts except 1 unit



Step 325
IMEC 3 or 4 ?
Yes
No
Step 326
Cust. wait-time ?
Yes
No
Step 327
Facilities ?
Yes
No
Consol. Inventory
Step 328
Step 340
Excess > $2,000 ?
Yes
No
Stop
No excess
Cancel PR's
excess
Step 16
Step 341
Storage Facil. ?
No
Yes
Stop
Step 335
Adeq. Storage Facil. ?
Yes
No
Step 211
Cancel excess Qty
Step 336
Stop
Step 329
Excess < $10,000 ?
Yes
No
Stop
Step 330
Step 331
Any PR's ?
Yes
No
Step 332
Term. PR's
No excess
Stop
excess
Step 333
Excess < $50,000 ?
Yes
No
Step 215


Step 350
Compare shelf life to RDD's
foreign
others
Step 351
compute costs
Step 352
compute proceeds
Step 353
compare costs to proceeds
pos.
Step 15
negative
Stop
Step 355
Align Rqmts. to RDD's
Step 360
Cancel PR's in excess of shelf-life
Step 361
excess > $2,000 ?
Yes
No
Stop
Step 362
Protect min. demand shelf-life or PCLT
Remainder
Step 15
Minimum
Stop

LIST OF REFERENCES

1. Aviation Supply Office, *On-line Requirements Determination Model*, Developed by the ASO Systems Development Division, Code 042.

2. Aviation Supply Office, OP Policy and Procedures Memo #235, *Procedure for Use of Due-In Long Supply (DILS) Material For Government Furnished Equipment (GFE) and Government Furnished Material (GFM) Requirements*, June 16, 1988.

3. Aviation Supply Office, OP Policy and Procedures Memo #245, *On Order Termination Processing*, August 10, 1989.

4. Ballou, R.H., *Business Logistics Management: Planning and Control*, 2nd ed., Prentice-Hall, Inc., 1985.

5. Blanchard, B.S., *Logistics Engineering and Management*, 3rd ed., Prentice-Hall, Inc., 1986.

6. Brody, A., "Product Comparisons: The Experts," *Infoworld*, pp. 59-75, June 19, 1989.

7. CDRMICOM, Redstone Arsenal, Naval Message, Subject: Sale of Long Supply Assets to Foreign Military Sales (FMS) Customers in Lieu of Overhaul, 081800Z Jul 86.

8. Chapman, G.J., *Termination of U.S. Navy Procurement Contracts for Secondary Items in Long Supply*, Master's Thesis, Naval Postgraduate School, Monterey, California, June 1988.

9. Chase, R.B., and Aquilano, N.J., *Production and Operations Management: A Life Cycle Approach*, 5th ed., Irwin Press, 1989.

10. Cibinic, J. Jr, and Nash, R.C. Jr, *Administration of Government Contracts*, 2nd ed., The George Washington University, 1986.

11. Defense Logistics Agency, UNCLASSIFIED Letter DLA-ACM to Naval Supply Systems Command, Subject: Estimated Costs Regarding Termination for Convenience (T4C) of Contracts for Due In Long Supply (DILS) Stock Items, June 10, 1988.

12. Defense Logistics Agency, *Mechanization of Contract Administration Services System (MOCAS) On-line Inquiry User Procedures*, June, 1988.

13. Department of Defense, Defense Audit Service, *Report on the Review of the Retention and Transfer of Material Assets*, Report No. 79-080, May 4, 1979.

14. Department of Defense Inspector General, *Audit of the Administration of Contract Terminations at the Navy Aviation Supply Office*, Project 6AC-085, June 5, 1987.

Department of Defense Inspector General, *Audit of the Administration of Contract Terminations*, Project 8AC-5006.03, July 31, 1989.

16. Department of Defense Instruction 4005.16 (DODI 4005.16), *Diminishing Manufacturing Sources and Material Shortages Program*, May 16, 1984.

17. Department of Defense Instruction 4140.24 (DODI 4140.24), *Requirements Priority and Asset Application for Secondary Items*, September 10, 1969.

18. Department of Defense Instruction 4140.39 (DODI 4140.39), *Procurement Cycles and Safety Levels of Supply for Secondary Items*, July 17, 1970.

19. Department of Defense Instruction 4440.23 (DODI 4440.23),

20. Department of the Navy, Fleet Material Support Office Instruction 4400.12J (FMSO INST 4400.12J), *Instructions for Management of Navy Retail Supply System Material*, March 8, 1989.

21. Department of the Navy, Fleet Material Support Office, *Economic Threshold for Recommending Termination of Purchase Requests and Contracts*, ALRAND Working Memorandum #515, June 30, 1986.

22. Department of the Navy, Fleet Material Support Office, Functional Description/System Specification, FD/SS-PD81, *Contract Termination Model*, FMSO Document No. N9322-D81-9095, January 30, 1990.

23. Department of the Navy, Naval Air Systems Command Instruction 4341.4 (NAVAIR INST 4341.4), *Government Furnished Equipment Program Management in the Naval Air Systems Command (NAVAIR)*, January 10, 1984.

24. Department of the Navy, Naval Audit Service Northeast Region, Audit Report C24966, July 8, 1977.

25. Department of the Navy, Naval Supply Instruction 4500.13 (NAVSUP INST 4500.13), *Retention and Reutilization of Material Assets*, January 12, 1990.

26. Department of the Navy, Naval Supply Publication 553 (NAVSUP PUB 553), *Inventory Management*, June 3, 1988.

27. Department of the Navy, Naval Supply Systems Command UNCLASSIFIED Letter 0221: MCC Serial 4370 to Navy Aviation Supply Office and Navy Ships Parts Control Center, Subject: Requests for Estimated Contract Termination Costs From DCAS Due to long Supply, July 28, 1988.

28. Federal Acquisition Regulation, U.S. Government Printing Office, Washington, D.C., June 30, 1987.

29. Hughes, T.W., and Duke, J.R. Jr, *An Analysis of Government Contract Terminations*, Master's Thesis, Naval Postgraduate School, Monterey, California, June, 1985.

30. LaLonde, B.J., and Zinszer, P.H., "Customer Service: Meaning and Measurement," paper presented to the National Council of Physical Distribution Management, Chicago, Illinois, 1976.

31. McFadden, S., "DILS/DICI/Terminations," paper presented to the Navy Aviation Supply Office, Philadelphia, Pennsylvania, November, 1989.

32. Reynolds, K., "Termination Model," paper presented to the Navy Aviation Supply Office, Philadelphia, Pennsylvania, June 9, 1989.

33. Telephone conversation between Mike Pawlush, Code 9123, Fleet Material Support Office and the author, April 4, 1990.

34. United States General Accounting Office, *Utilization of Navy Long Supply Aviation Assets - Improved Coordination and Supervision Needed*, GAO/PLRD-82-121, September 17, 1982.

35. Whitin, T.M., *The Theory of Inventory Management*, Princeton University Press, 1957.

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